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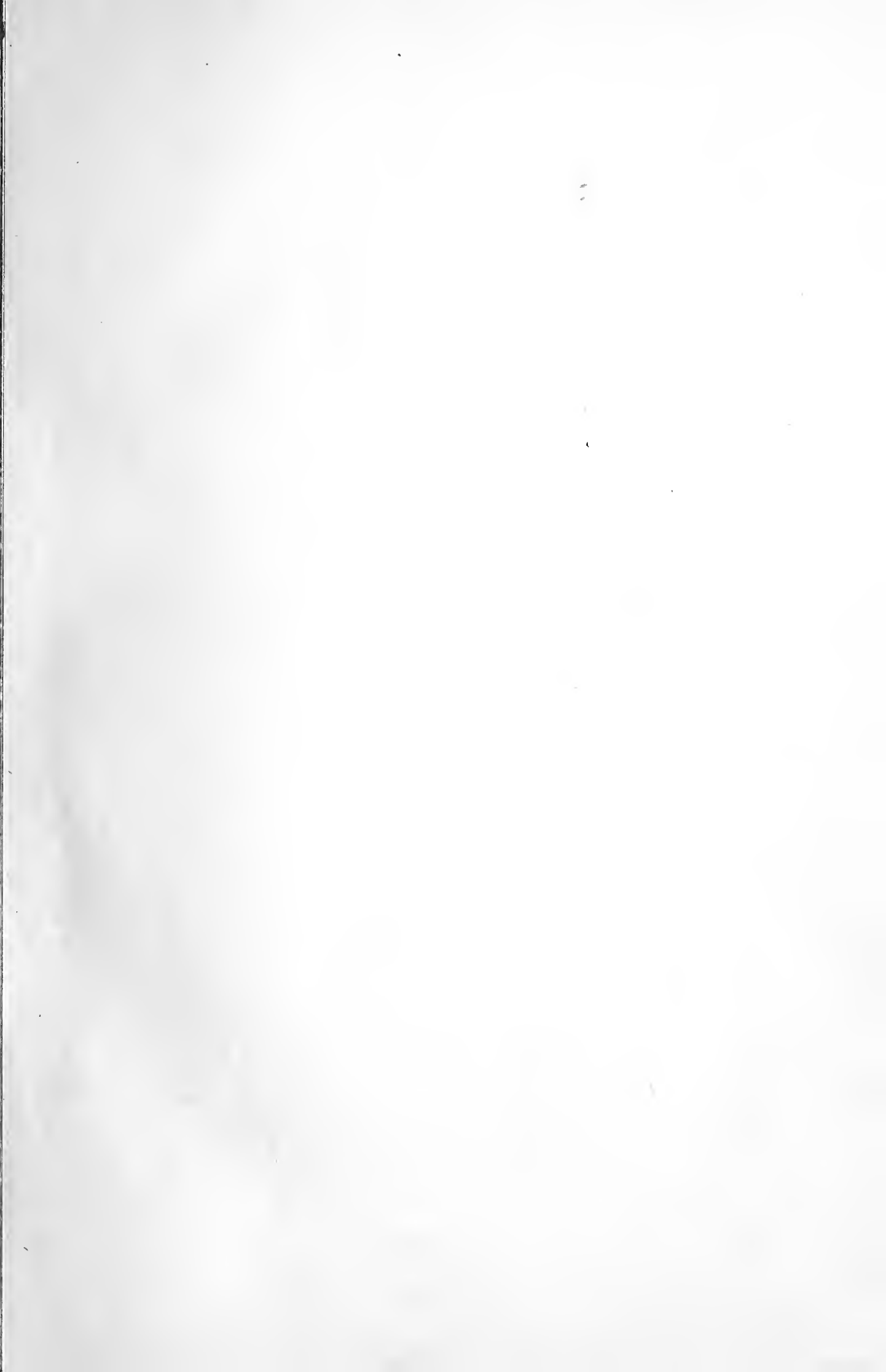
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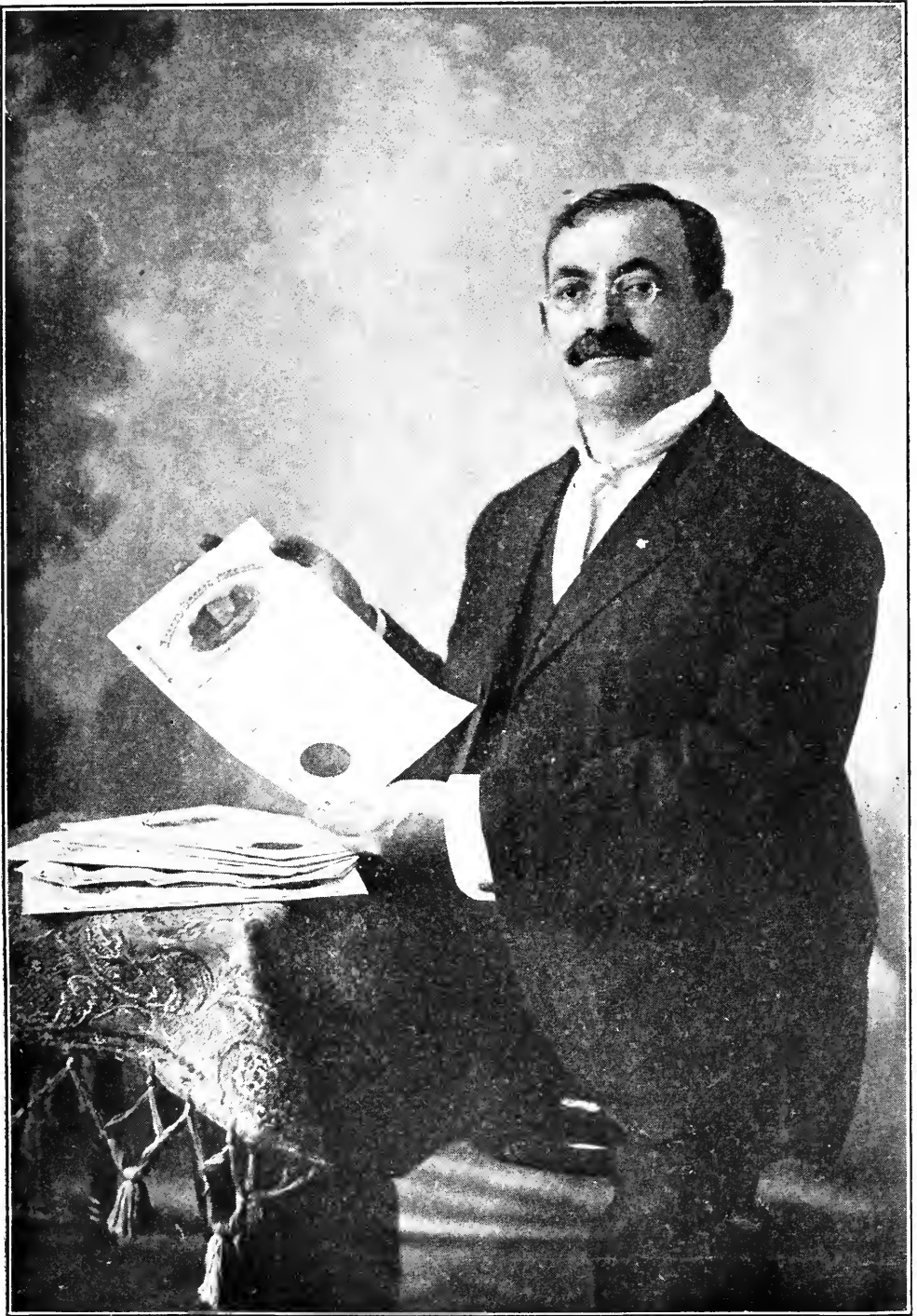
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Chas. S. Labofish.

HOW TO WIN FORTUNE BY INVENTING

COUCHED IN A READABLE STORY.

CONTAINING COPIOUS DEMONSTRATIONS, ILLUSTRATIONS, EXAMPLES AND SPECIFIC INSTRUCTIONS ON

How to Make Commercially Valuable Inventions;

How to Acquire a Knowledge of Mechanics;

How to Invent Elaborately and Methodically;

How to Make Money Out of Patent Rights;

How to Approach and Interest Capitalists;

How to Build Models Economically;

Gists of Patent Laws, Etc., Etc.

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By CHARLES S. LABOFISH.

ATTORNEY AND COUNSELOR IN PATENT CAUSES.



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"Knowledge is that which, next to virtue, truly
and essentially raises one man above another."

—Addison.

PREFACE.

Knowledge is the mighty power which raises one inventor above a thousand uninformed inventors. With a thorough knowledge of all the ins and outs leading to financial success by inventing, one who is endowed with even a limited measure of inventive ingenuity has a fair chance to win fame and fortune by inventing. Without such knowledge, tens of thousands of inventors fail to realize on their inventing.

Millions of guide and hand books, booklets and circulars are annually distributed gratis among inventors. Very naturally these books and booklets teach the inventor what the distributors want him to know, not what he ought to know. In consequence whereof, the majority of inventors grope in Cimmerian darkness and meet with harrowing disappointments.

There are several books on how to make money out of patents. But before one can make money out of a patent he must have a patent that is worth money; before one can get a patent that is worth money he must have an invention that is legally entitled to such a patent; and before one can make such an invention and get such a patent he must have the knowledge contained in this book.

Tens of thousands of inventors misspend their talents, sink large sums of money, and waste their most brilliant opportunities for financial success by inventing for want of the very knowledge contained in this book.

He who would win fortune by inventing must have a commercially valuable invention. A commercially valuable invention consists of a legally-recognized invention that is commercially desirable, and a legally-valid patent that is commercially acceptable. His invention may be a mere improvement in mouse traps, in collar buttons, in pots and pans, in pens and pencils, in any of the tens of thousands of articles of commerce, small or large, simple or intricate. But unless it comprehends all the four essentials of a commercially valuable invention, the wooer of

fortune by inventing can win nothing but frowns from that severely-exacting, mythical dame—Fortune.

This book defines and expounds the four essential requirements of a commercially valuable invention with all the detail necessary to a clear comprehension. To facilitate the consummate digestion of the various subjects herein treated, and to make its reading interesting to young and old of both sexes, the book is written in the vein of a narrative in which the characters of the story are taught the art of making commercially valuable inventions and all the important ins and outs conducive to financial success by inventing. The reader is thus instructed and amused at the same time.

The narrative style of this work has many other advantages over the usually dogmatic lecture or discourse style. It facilitates the giving of specific instructions without presuming upon the intelligence of the reader; it fires the reader's mind with an ardent ambition to emulate the achievements of others; it affords the reader an insight into the natural tendencies of the uninformed inventor to commit errors and make blunders which in every instance culminate in financial disaster, and thus puts him on his guard; etc.

With this book before him, he who is determined to win fortune by inventing has a personal instructor and legal adviser at his elbow. The author of this book is a practical mechanic and patent attorney. This book is the result of large and varied actual experience with the production and disposition of patents and inventions, legal and technical knowledge, and studious observations of effects and consequences tending to financial success or failure extending over a period of twenty years. The instruction, information and advice herein contained may therefore be fairly relied upon.

The Author,
CHARLES S. LABOFISH.

Washington, D. C., October, 1911.

TABLE OF CONTENTS.

PART I.

THE DESPONDENT YOUTH.

A TRAGIC STORY OF A FINANCIALLY EMBARRASSED YOUTH, COUCH-
ING A DISCUSSION ON THE PROS AND CONS OF INVENTING.
Pages 11 to 29.

PART II.

AN EXPOSITION OF THE ART OF PRACTICAL AND PROFITABLE INVENTING.

	PAGE
Lesson I. The Commercially Valuable Invention.....	33
II. The First Essential of a Commercially Valuable Invention	36
III. The Second Essential of a Commercially Valuable Invention	42
IV. How To Do the Inventing.....	46
V. How To Acquire a Working Knowledge of Prac- tical Mechanics	50
VI. The Knack of Practical Inventing.....	57
VII. Comment On the Crude Model.....	63
VIII. How To Invent Labor-Saving Machinery.....	68
IX. Fortuitous Conceptions	80
X. Court Criticism and Invite Suggestion.....	95
XI. Gears, Their Names and Uses.....	104
XII. Improvements Upon Improvements.....	111
XIII. Kinds of Improvements to Invent.....	119
XIV. Electro Mechanical Inventing.....	129
XV. Foolish Inventions	137
XVI. The Third Essential of a Commercially Valuable Invention	143
XVII. The Free Preliminary Examination	146
XVIII. Fool Patents	157
XIX. How to Make Money Out of Patent Rights....	162
XX. Assignments and Contracts	187
XXI. How to Build Working Models Economically...	192
XXII. The Fourth Essential of a Commercially Valuable Invention	200

LIST OF ILLUSTRATIONS.

	PAGE
Frontispiece	
Plain Wire Cutting Nippers.....	47
Lever of the First Order.....	53
Lever of the Second Order.....	54
Lever of the Third Order.....	54
Compound Leverage	56
Application of Compound Leverage.....	58
Another Application Thereof	64
Bobbin Winder	73
Log Sawing Machine.....	81
Adjustable Utensil Support.....	85
Improvement Thereon	90
Latch Lock	94
Iron Gear Exhibition Machine.....	106
Brass Gear Exhibition Machine.....	108
Combined Caliper and Square.....	123
Electro Magnet	132
Electro Mechanical Device.....	134
Mechanical Motor	163

Most of these illustrations have been especially invented by the author for the purpose of illustrating the lessons.

PART I.

THE DESPONDENT YOUTH.

“Come then, oh care! oh grief! oh woe!
Oh troubles! mighty in your kind,
I have a balm ye ne’er can know,
A hopeful mind.”

—*Vane.*



"Work without hope draws nectar in a sieve,
And hope without an object cannot live."
—Coldridge.

The Despondent Youth.

At the close of a very busy day I was leisurely arranging a mass of jumbled papers that had accumulated on the desk during the day, deeply engrossed with the reminiscences some of them brought to my mind. My stenographer, Miss Sharp, a spruce nymph of rather finical propensities, was tranquilly flaunting her charming face in the wee mirror in the clothes rack, adjusting her hat preparatory to leaving the office after her day's work. Her brother, Joseph Sharp, a pert stripling of seventeen years of age, an apprentice machinist by trade, sat recumbently in his sister's revolving chair, gyrating himself listlessly upon its screw, amusedly watching the deft performance of her nimble fingers as she was skillfully creasing and curving the decorative flora and fauna of her new summer hat.

In the midst of this placidity, my nephew, William Swift, rushed impudently into my office without greeting me or the young lady, the idol of his admiration, nor her brother, his quondam crony. Swift slammed the door behind him, dropped impetuously into a chair at my desk, threw down his hat upon the floor with a violent bang, and slapped his thigh resoundingly with a mutter of utter disgust and dire impatience.

A glance at him frightened us all. His hair was disheveled, his eyes were wild with suppressed emotion,

his hands trembled, his lips quivered. Altogether his ever lissom, cheerful person presented a lurid picture of petulant perturbation.

"What is wrong, William?" I inquired greatly alarmed.

"Nothing serious. I am tired of living, that's all," he answered irascibly, bewildered and simpering languidly at my undue consternation. He was evidently unconscious of his own frightful ghastliness.

"The deuce you are!" I exclaimed tremulously, frightened by the ominous reply. "A bright, intellectual, athletic young man of twenty-one years of age endowed with a fairly good education and a well requited trade is tired of living!" I continued reproachfully. The unusual pallor, almost cadaverous appearance, of his face and his somber, shocking remark nearly paralyzed me. I perceived that it was no mere capricious whim, but a cloud of serious despair that hovered over him and was apprehensive of some serious disaster. Miss Sharp, too, was shocked by his portentous remark; and so was her brother. The thought that a promising youth in full bloom of life and enjoyment of health is tired of living stayed the departure of the girl and her brother. They, too, thought something unusual had happened to him and turned their full gaze upon his drooped eyelids; scrutinizing him sympathetically, patiently waiting to hear what had befallen him.

William shook his head dejectedly and smiled doggedly, "Yes; bright, intellectual, young, education, and a trade, but unable to earn enough to support my aged and decrepit parents and myself," he returned moodily. "Since I quit the Government Printing Office I have been tramping every day from eight o'clock in the morning until five in the evening in quest of some suitable work, but can find none."

I remained silent; reflecting upon the situation and meditating upon how I could possibly help him. I know how need, idleness, and the usual humiliation and embarrassment of an applicant for a position act upon a haughty, youthful spirit of a hitherto careless youth, and sought words to console him. But Joseph Sharp, with a sigh of relief at the knowledge of the cause of Swift's distress, exclaimed encouragingly, "Oh, that's nothing, Will! I know dozens of young men out of work, yet none talks such foolishness. Cheer up, old boy! You have a pretty good trade. You'll find a job alright, alright."

Swift shook his head somberly and murmured ruefully: "A pretty good trade, yes. I wish I had never seen the inside of a printing shop. Even if I should find a job at printing I cannot hope to make so much as one-third of the wages I was making in the Government Printing Office."

"That's it," I said to myself. The fact that he is obliged to lower his standard of living works upon him so powerfully. Enforced retrenchment in one's style of living is indeed a matter very apt to drive a young and inexperienced person to desperation. William held a very lucrative position in the Government Printing Office and for some reason was cashiered. To a private printer his services, if they were worth anything, were probably worth not more than one-third of what he was earning before. He knew that and it worried him beyond endurance. Thinking he may be in immediate need of funds or may have some plan whereby I could be of assistance to him, I asked him in a whisper, "Is there anything I can do for you?"

"No, thanks," he replied convulsively; poignantly offended by my inquiry. "I have no immediate need of anything, except perhaps of some consolation or a bit

of advice. I came up thinking you may know of something other than printing that I might take up with a certain degree of assurance of success. In fact, I confess, I don't know just what I came up for. I was brooding so much over the irony of my fate that life became a burden to me, and some inexplicable impulse sent me up here."

"Brooding over the irony of fate until life became a burden!" Miss Sharp mumbled audibly, dilating her exuberant eyes in bewilderment, "and all because of the loss of a job! I should like to have a look at your face, Mr. Swift. I can hardly believe you are the young man I have had the pleasure of entertaining in my home recently." Swift looked up to her with a luminous, but mirthless, smile on his livid face; blushing and flushing from shame and embarrassment. She was the living expression of his ideal, and he virtually worshipped her. Her comments on his thoughtlessly uttered portentous remark moved him to compunction.

Swift, in his normal mood, is a fine specimen of a prepossessing young man. The terrible change in his appearance and manners rendered him almost impossible of recognition.

"The loss of my position is to me more than the mere loss of a job, Miss Sharp," Swift answered hoarsely with a lingering smile on his parched lips, trying hard to appear pleasant. "No one knows another's burden. I am in a terrible predicament. I belong to several clubs, organizations, and associations; and because of my inability to pay the dues, I will now have to drop out of them. The loss of my position is a most awful bereavement to me, Miss Sharp. After four years of conspicuous activity in society I will now have to begin to live the life of a recluse, move into small apartments, and lower my standard of living to a pauper's scale."

"Then it is the loss of your time-killing club associations you are bewailing," the girl rejoined, smiling and making light of the repiner's forebodings. "Oh, ye of little faith!" she continued piously. "Life has many other sources of happiness and countless little pleasantries which one may enjoy at much less expense than half a dozen club and lodge memberships, social parties, or any of your costly votaries. Why bewail the loss of a job that paid a little more money when the next one pays enough to live upon? Due submission to Providential guidance and a little judicious scrimping would enable you to live on your curtailed income as happily as before. Brighten up, Mr. Swift, and take a little stroll with me down the Avenue."

Swift gazed at her for a few moments, obviously undecided whether or not he should accept her invitation, and finally decided in the negative. He dropped his head into the palms of his hands with a deep sigh. The young lady's sapid little homily not only failed to relieve him of the hypochondriac, but flagrantly rendered his affliction more poignant. He blinked her gaze, winced restlessly, and wretchedly relapsed into his former state of lugubriousness.

While I greatly admired the young lady's promiscuous objurgation and advice, I failed to appreciate the wisdom of such animadversion and exhortation. The idea of persuading an able-bodied, sound-minded, enlightened youth—imbued with boundless voluptuous desires—to submit to forced scrimpedness and piously endure his harrowing bereavement indefinitely did not impress me favorably.

Piously submitting to the chastisement of Fate is not only not a religious virtue, but a scathing subterfuge from moral duty to combat her manfully.

Moreover, I knew that preaching contentment with godliness to an enlightened, mundane, twentieth-century youth was not at all likely to quench his thirst for social distinction; nor assuage his hankering after living in a commodious house, reposing before a liberally provisioned table, and having sufficient funds at his disposal to gratify his habitual generosity.

A being accustomed to live in an impregnated atmosphere cannot thrive very well on rarified air.

Thousands of well informed young persons who, like Swift, found themselves suddenly deprived of a pristine monetary resource failed to heed the trite admonition to resign piously to Providential guidance and be thankful for the privilege of ekeing out a miserable existence. In the absence of a possibility to recoup their losses they sought relief either by hurling their souls into eternity or by drowning their grief in insidious grog-shop mellifluents. Hence, nothing short of a well grounded prospect of restitution to their former level and a tangible hope for a still brighter future can possibly relieve such persons materially.

Acting upon this cognizance I leaned over toward my disconcerted nephew and humored him: "You are right, William. Miss Sharp never felt the sting of want and humiliation so she cannot sympathize with you nor offer you practical advice. A light purse is a heavy curse. The advice she gave you is the standard religionary article foisted upon the unfortunate by ascetic teachers and preachers of godliness whose idea was that God delights to see His creatures steeped in misery. It is perhaps good enough counsel where the case is really irremediable. But it won't do in your case. Were Miss Sharp in your predicament, being young and childishly foppish in her predilections and propensities, she would hardly content herself with the costless precious little

pleasantries, great and grand a Divine gift to mankind as they really are; but would probably bemoan her inability to hoard more trumpery as much as you do your inability to keep up with your friends.

"Money is the root of all the blessings, comforts, and enjoyments our high state of civilization affords. Money is the only harbinger of our temporal enjoyments and the provident of our spiritual delights. With money a great deal of good can be done; without it, precious little of real value to our fellow men. Money, and plenty of it, is therefore what you need and money is what you should diligently seek to acquire. Not to make money your fetich, but to enjoy the good of the land that can be bought therewith and the fruition of the infinite pleasure that is afforded by lending a helping hand to our fellow men when in need of financial aid.

"Money carries a dulcet message to the human heart that, like happiness, is the supreme desideratum of mankind. But, alas, in effect, it is only the wish to have money and the craze for frenzied exhilaration that the mass of mankind unconsciously cultivate.

"Not scrimping, nor relapsing into an everlasting lethargy of contentment with godliness, but money, and plenty of it, is what you want, William. But how to get money is the all important question. Now, there are thousands of ways to get money, but they are not open to the impecunious individuals of ordinary intelligence. Stocks, bonds, real estate, and every other kind of revenue-yielding property-right, must first be bought, and that requires capital. The patent of invention is the only kind of valuable property-right that an earnestly ambitious individual can acquire without capital. By means of a gift [invention] of something that the people either need or want, Dame Fortune is easily won if you know how to court her.

"Now, what I can do for you, William, is to familiarize you with the principles underlying the art of practical and profitable inventing. By means of a course of instructions in the art of practical and profitable inventing I have recently devised, I am able to put you in a mental condition favorable to conceiving new and useful mechanical principles and to instruct you on how to embody the new principles in the most practical manner, how to protect your inventions properly, and how to dispose of the property-right vested in the patent profitably. You may or may not make a great fortune out of your inventing, but if you will scrupulously follow the instructions I will give you, you are most likely to make some money out of your inventing and may reasonably hope for more, even for the acquisition of an immense fortune by your personal effort. With such prospects in view, you can afford to retire into seclusion for a while and devote the evenings of a few months time to the study and practice of the art of practical and profitable inventing. This will result in cutting out for a while a deal of expenses and thus enable you to live upon the wages you can command. After you have made some money from your inventing, you can rejoin your clubs. Your friends, I assure you, will gladly receive you and appreciate you more than ever."

Until the last few minutes my nephew listened to me attentively and hopefully. As I came to the proposition I broached, he dropped his head to evade my gaze and mumbled something in an undertone. He shook and trembled more violently than before, obviously disappointed. Upon looking at him inquiringly he answered peevishly:

"You may as well try to make a professional baritone of me when I have neither voice nor ear for vocal music. Nature denied me the gift of genius; what good would

the knowledge of the principles of the art of practical inventing and of making inventions commercially valuable do me?"

The question appealed to my stenographer quite logically. I could tell by her impatient shifting that she agreed with him on this particular subject. But I paid no attention to her emotions and replied to my nephew with an impulsive "Tut, tut! You don't know your own self, William. You are endowed with an inventive faculty that may be capable of great achievements. A practical knowledge of how to arouse that faculty and how to exercise your mental activity and acumen, some discretion, and a reasonable measure of moral courage is all you need to bring that faculty into play and make it yield a fair revenue."

I knew my stenographer thought well of my nephew, but she never betrayed the slightest interest in him—she later confessed that she really had none. Now she became intensely apprehensive for his welfare. The girl stirred uneasily. I understood she had something to say. As my nephew remained silent, I encouraged her to express her mind freely whatever it might be, assuring her of being affable to relevant conversation. She blushed, smiled and said diffidently:

"It is indeed very generous and kind of you to offer to spend your valuable time in teaching him the principles of inventing. But I fear it may be a sheer waste of your time and energy and may result in a terrible disappointment to our mutual friend, Mr. Swift. Using his own premises, the vocalist conscientiously believes that every person could learn to sing as thrillingly as he does, if he only trained himself as persistently as he did. But as a matter of fact the vocal organs of all individuals are not attuned alike. Some are attuned to sing; others, only to speak melodiously; still others, only suffi-

cient to talk modulately; and still others, only to croak huskily. So, it seems to me, it is with inventing. Some minds are constituted to invent in the industrial arts; others, in the esthetic arts; still others, in the literary arts, and still others, in formulating financial schemes. The mass of mankind is obviously destitute of inventive ingenuity of any kind. Dryden says:

Time, place, and action may with pains be wrought,
But genius must be born and never can be bought.

"Besides, thousands of inventors own patents from which they are unable to realize even so much as the cost of the patent," she concluded with a self-conscious smile.

"In other words, Miss Sharp, your idea is that inventing for profit requires genius, and as genius must be born and never can be bought, none but the born geniuses can invent; as thousands of inventors never realize even so much as to defray the cost of the patents, inventing must be a profitless venture. Well, this is unfortunately the general impression, and because of that some of the most capable never give the subject a single thought. As a matter of fact the majority of the born geniuses are incapable of practical and profitable inventing. The mind of the born genius is too excited, and any attempt at inventing plunges his creation into the abyss of impractical and unprofitable complexity. This is one of the reason why so many thousands of patents never materialize, and lack of knowledge and earnestness, gullibility and impatience on the part of all the impromptu inventors are some of the others. The inventions of many born geniuses are frequently more curious than useful, and almost in every instance impractical, and therefore commercially valueless; and in many thousands of instances in which the inventions are be-

yond reproach, the fault lies in the patents. Hence the failures you mentioned.

"Practical inventing requires not flurried genius, but habits of calm and calculative observation and reflection; and profitable inventing requires, in addition thereto, just such knowledge as I propose to impart to him. Failure in any venture is almost in every instance traceable to lack of knowledge and cool, calm, deliberate action. With a fair knowledge of the rudimentary principles governing patents and inventions, a person of moderate temperament and studious habits has a fair chance to educe something new and useful of intrinsic commercial value."

"But to educe something new and useful requires considerable ingenuity, if not actual genius," argued Miss Sharp earnestly, "and that Mr. Swift may not possess."

"Yes, to educe something new and useful requires some ingenuity, Miss Sharp, but only so much as every sound-minded person of ordinary intelligence is naturally endowed with. But perhaps you do not know what 'something new and useful' means, when speaking of inventing, and the possibilities of making immense fortunes from an apparently most insignificant something new and useful. To illustrate how little ingenuity is required to educe something *new and useful* of intrinsic commercial value and thus make money by inventing, and often a lot of it, I will take the liberty of asking you why you use crimped hair pins in preference to the smooth-limbed ones."

"Because the crimped hair pins do not slip out as easily as the smooth ones," stuttered the girl with a flush at the reference to her choice in personal effects.

"Well, then, the profits that formerly went into the coffers of the manufacturers of the smooth-limbed hair

pins now go to that born genius, the inventor of the kinks in the hair pin, whom all the governments on earth consider justly entitled to, just because he was the first to conceive the idea. Did it require genius or considerable ingenuity to invent kinks in hair pins? Certainly not! But it did require *exercise* of the inventive faculty. The inventive faculty is as much a part of every human being as every other faculty in the human mind, only in most of us it is paralyzed from disuse."

"Gee! Do you call making kinks in a hair pin inventing? Why anybody can do that!" ejaculated Joseph Sharp convulsively.

"Every improvement in a thing of use, no matter how simple or apparently insignificant that improvement may seem, if it is new and useful it is the act of invention in the eye of the law and the subject of a patent.. The fact that neither the manufacturer of the smooth-limbed hair pins nor the millions of women that used hair pins ever since they have been invented have thought of kinking the limbs of hair pins in order to prevent them from slipping out easily proves that it is not a mere matter of mechanical skill, or, as Joseph says, everybody could do, but an act of invention. It is true that everybody else could have put a few kinks in a wire, but the patent law has it so that only the person who first thinks of putting in the kinks is entitled to a patent therefor. Any person can attach a piece of sheet metal to the tip of a child's shoe, but only the first one who did it was entitled to a patent upon which he realized nearly two million dollars. Any person can put four rollers under the foot to skate upon, but only the one who first thought of it was entitled to a patent therefor and made one million dollars out of it."

My nephew raised his head slowly and looked at me curiously. "There are thousands upon thousands of

scientists, engineers, mechanics and mechanics who do nothing else but look for inventions; what on earth makes you think that I, who know absolutely nothing about mechanics, could successfully compete with them?"

"There is no such a thing as competition in inventing. The act of invention is literally a happy thought—a lucky strike—a flash of intellectual brilliancy which in the nature of things is sooner or later likely to happen to every person who incessantly exercises his inventive powers, and after being duly initiated in the craft you are as likely to hit upon something of great commercial value as any of the others.

"Indeed, so far as the conception of the cardinal principles of the invention is concerned, the most learned scientist, the cleverest engineer, the smartest mechanic or the most skillful mechanic has no pre-eminence over the illiterate backwoods man. Professor Langley of the Smithsonian Institute, assisted by a corps of scientists and mechanics, spent about \$75,000 and twenty years time in his attempt to produce a heavier-than-air flying machine and accomplished just nothing. A poor mechanic, a bicycle fixer, conceived the principles of the aeroplane and startled the world with his inventive achievement.

"In countless millions of men and women the world over an inventive faculty of the highest order is pent up like a ferocious tiger in a small cage, raging to give expression to its power, and in the absence of knowledge how to do it legitimately, breaks out in crime. Millions of persons endowed with as great an inventive faculty as Mr. Edison, Mr. Westinghouse, or any of the renowned inventors of the past or present generations lived in dire poverty and died in total obscurity because of lack of an opportunity to learn how to exercise and utilize their natural talents. Thousands upon thousands of the finan-

cially embarrassed who sought relief in oblivion could have found financial relief by the exercise of their inventive powers, if they had had an opportunity to learn how to do it. Thousands upon thousands of those who now resort to all kinds of meandering schemes to get money could get money honestly and honorably by the exercise of their inventive powers, if they only knew how to do it.

"Among the countless millions who now eke out a miserable existence there are many who could better themselves by inventing, if they only knew how to go about it. Among the countless thousands who now own patents upon which they are unable to realize even so much as the costs of the patents many of them could have owned patents upon which they might have realized immense fortunes, if they knew what they ought to know about patents and inventions.

"The knowledge of these facts prompted me to devise a course of instructions in the art of inventing and to formulate some expert information and advice on patents and on the disposition of patents. The study and practice of these instructions will in no wise interfere with one's regular vocation; indeed, they will make one's work more interesting and will put the learner in a fair position to make practical and profitable inventions."

Miss Sharp was now fully convinced of the intrinsic value of the knowledge I was offering to impart to him, and, after apologizing to me for her lack of forethought and due appreciation of my deep concern for my relative, touched his shoulder familiarly and affably remonstrated:

"Well, then, Mr. Swift, you better ask your uncle to tell you all about patents and inventions, and follow his instructions to the letter. You cannot now fail to perceive as well as I do that learning the art of practical inventing will open for you a new field of activity of

unusually great financial possibilities. So cheer up, Mr. Swift, and make the most of the opportunity."

Joseph Sharp was now aflame with enthusiasm over inventing, and exclaimed: "I wish I had the opportunity to learn how to invent. I would be practicing day and night and every minute of my life until I mastered the art thoroughly." But my nephew shifted uneasily at the girl's advice and mumbled: "I have no ingenuity at all. I could not invent even a kink in a hair pin." As she looked at him with feigned displeasure at his conclusion, he began to fidget, wriggle, and squirm in his chair as if he sat on a hot stove. He darted furtive glances at the bystanders and involuntarily sighed out a deprecatory, "O Lord, I am lost!"

My heart melted with pity. I had talked and argued and reasoned with him and showed him that he was not lost, but that on the contrary he stands a fair chance to make more money than he ever dreamed of. Having exhausted my stock of arguments and persuasions, I tried a little harshness and retorted: "You are right, William. You are lost. Lost among the millions of insipid repiners and suppiners who pine away all their lives in abject indigency rather than make an earnest, honest, well directed effort to rise to the level of prosperity of their fellow citizens, and above if possible."

"You don't know my wretched plight, uncle," he whimpered mournfully. "Even if I should learn how to invent, the monetary compensation that may result from my inventing is still in the remote future, while I must have a regular, infallible, sufficient monetary resource right now. I shamefully confess that in my harvest days I failed to provide for a rainy day; and now it seems nothing can save me from perdition. I have so many bills to pay the first of the coming month, that—" He dropped his head into the palms of his hands and broke

out in silent lamentation. A few minutes later he looked up to my stenographer and resumed his quandary.

"If I appear pusillanimous it is because you do not know my financial straits, Miss Sharp." I pretended to divert my attention from him to a letter I picked out of the pile of papers and he appealed to the girl.

Miss Sharp listened to the youth's jeremiade concernedly and looked into his drooped face compassionately, deeply touched by the appeal and the seriousness of his dilemma. Her bosom heaved with pity. Swift read commiseration in her face, and so did I. I perceived she wanted to say something and motioned to her to go ahead by all means, for unless his mind is immediately diverted from his brooding, the Lord knows what may happen.

Miss Sharp is a gentle, sympathetic, enlightened, tactful girl. Having failed to do so myself, I hoped her angelic chanting may bring him to himself. To my great consternation, the girl grinned at him derisively, like an enraged old vixen, and drawled out irefully:

"I certainly do pity your lamentable unmanliness, Mr. Swift. Pardon my incivility." Swift jerked up his head with an air of stupefaction and glared at her appalled. "I am greatly disappointed in you indeed," she continued relentlessly. "The few good traits I so admired in you seem to be sadly occluded by your inability to cope with the present situation. You seem to be utterly incapable of grappling with the ordinary vicissitudes of life. And what is worst of all, you have not mettle enough in you to grasp Opportunity by the forelock when she is trailing at your very coat-tail.

"What a paucity of common sense in a full fledged man!" she continued. "Do you expect to regain your social standing, maintain your standard of living and pay up your accumulated debts with brooding over the

irony of fate, getting tired of living and asserting that of all men Nature created you a brainless soul? I have no patience with such an unmanly man. Come, Joseph, let us go," and began to pull on her gloves.

Swift gasped for breath. Much as he tried he could not possibly utter a word. His tongue clove to the roof of his mouth. Large globules of cold perspiration oozed from his forehead. His whole person fluttered like an aspen leaf in a gentle breeze. His head was giddy as if he were in a violent whirl, and his heart was beating in his throat. The caustic reprimand seemed to choke him and press upon his aching heart as if he were under the influence of an incubus. But finally he managed to stammer out sulkily: "What is a man to do when he finds himself in such a precarious predicament; compelled to move into a five-room cottage from an eight-room flat, and —"

"A man to do!" reverberated his inexorable taunter ironically, peeling out a burlesque, rippling laugh that brought the janitor to the door and evoked a "Gee! What's the matter with you, sis?" from her prosaic brother who never dreamed that his sister was capable of such overwhelming blithesome hilarity. "Why your uncle told you what to do, and told you enough, I think. 'Plough deep while sluggards sleep and you shall have corn to sell and keep'—the good old apothegm of all wise counselors. But you, it seems, are not man enough to go to the trouble of plowing unless you are paid for it in advance. You seem to be one of those lethargical beings who would rather not risk getting up an hour earlier. So sleep on, sir, sleep on. Come, Joseph. I have no apology to make for the frank expression of my mind." The lady wheeled around abruptly and strode toward her desk, picked up something and moved toward the door.

Language is utterly impotent to depict the distraught youth's mental anguish, and the lacerations in the wounded heart the girl's incisive, scouting laugh had made. It virtually stunned him. The violent trepidation of his knees shoved the chair he was sitting on closer to me and I could feel the heat of his feverish breath as if coming from a hot air furnace. I feared the youth may succumb to the harrowing anguish and lose his mind or drop dead. I was about to resume consoling him, but before Miss Sharp opened the door Swift had jumped to his feet. He intercepted her and planted himself between her and the door. With tearful, violently trundling, inflamed eyes, fast beating heart and tottering knees, the youth stood before her in deprecatory posture and cried:

"Miss Sharp, Miss Sharp, permit me to thank you for your just reprehension and good advice. I did not realize my position until you told me of it. I should have known that it is dastardly shameful and unmanly for a man of my age to flinch at the first stroke of adversity. Lack of self-reliance warped my judgment and impatience blinded my understanding. I should have known enough to be up and doing long before the starlight waned, but it took a woman's nudgings and proddings to wake me up and make me shake off the arms of Morpheus that clasped me in their embrace. Now that I am awake and fully realize my position I shall heed your good advice, Miss Sharp, and plow deep while sluggards sleep. I will gratefully avail myself of my uncle's kind offer and strive to battle cruel Fate manfully. I shall not rest until I have subdued her and compelled her to make amends for the humility for which she is responsible."

The young lady instantly relented in her stern and belligerent attitude toward him and looked at him

benignly. She smiled at him sweetly, and proffering him her hand warmly congratulated him upon his transition from puerility to manhood. She expressed her earnest approval of his resolution with considerable emotion and with eyes filling to the overflowing concluded with: "Let us hope you will never again resort to brooding over the irony of Fate, Mr. Swift, instead of manfully battling and subduing her," and burst into tears.

The sublimity of the situation recalled to my mind Scott's sestet:

"O woman! in our hours of ease
Uncertain, coy, and hard to please,
And variable as the shade
By light quivering aspen made;
When pain and anguish wring the brow
A ministering angel thou!"

PART II.

AN EXPOSITION OF THE ART OF PRACTICAL *and* PROFITABLE INVENTING.

"Let us then be up and doing
With a heart for any fate,
Still achieving, still pursuing,
Learn to labor and to wait."

—*Longfellow.*



"Lend thy serious hearing to what I shall unfold."
—*Shakespeare.*

LESSON I.

The Commercially Valuable Invention.

On the evening of the following day my nephew appeared in quite a different mood. His countenance was beaming with a superfluity of eagerness and earnestness to learn the art of practical and profitable inventing that made Miss Sharp's heart throb with joy.

I remembered Joseph's emotions and his sister's remarks of the previous evening and invited them to join my nephew in the lessons. When all were conveniently seated around my desk I assumed the role of instructor and began:

"By way of preamble I may here premise that to learn how to invent is of little consequence, as hundreds of thousands of inventors have made inventions without having previously learned how to invent. To learn how to invent elaborately and methodically is of great moment, as countless inventors have made some very grave mistakes and serious blunders in their inventing. But to learn how to make commercially valuable inventions is of the utmost importance. Indeed, it is practically the all important thing the aspirant successful inventor has to learn, as lack of this knowledge is responsible for most, if not practically all, the failures of inventors. To win fortune by inventing one must have a commercially

valuable invention. The first question for us to consider is thus: What is a commercially valuable invention?

"An invented article of commerce that so soon as it is put on the market becomes very popular and begins to yield an immense fortune to its exploiters, is not necessarily a commercially valuable invention. The rubber tipped pencil, for example, was an invented article of great value to commerce, and yet it was not a commercially valuable invention. Its invention was not an invention in the eye of the law and the patent was therefore rejected by the courts. Having no patent, the inventor of this immensely popular and valuable article of commerce could not demand compensation for his inventing. Countless inventions that in the eye of the law are not inventions, are annually rejected by the Patent Office. Countless patents that in the eye of the patent buyers and investors are not patents, are annually issued by the Patent Office. Hence, the tens of thousands of disappointed inventors.

"A commercially valuable invention is an invention for which the inventor can command adequate compensation for his inventing. The possessor of such an invention has a property right for which he may demand cash, a royalty income, or a share in the proceeds resulting from the exploitation of his invention commensurate with the value of his invention to commerce.

"Now, in order to make you remember the difference between an invention and a commercially valuable invention, I am going to ask my friend Joseph a question. He being a sport ought to be able to answer it correctly. How many legs has a commercially valuable race horse—worth, say \$5,000, Joseph?"

Joseph, as will appear later, is a good inventor, but he was not a good listener, and he awoke as from a dream.

"I don't quite understand the question," he protested, very much puzzled at the irrelevancy of this query.

"Do you understand the question, Miss Sharp?"

"I think I do," she answered, not less puzzled than her brother. "A \$5,000 race horse has four legs."

"How much less than \$5,000 would such a horse be worth if it had only three legs?"

"\$5,000 less," answered Joseph quickly.

"Well, then, remember that, like a commercially valuable race horse, a commercially valuable invention must stand on four legs—essentials—and these are: 1st, a legally-recognized invention; 2d, a commercially-desirable invention; 3d, a legally-valid patent, and, 4th, a commercially-acceptable patent. These four requisites are the four legs, pillars, or essentials of a commercially valuable invention. The invention may be as simple as kinks in a hair pin, but unless it stands on these four legs it is not a commercially valuable invention. When any one of these four legs is missing the invention is worth as much as a race horse with one of its legs missing. Of the tens of thousands of unsold inventions now in existence, some of them stand on three legs, others on only two legs, and still others on practically no legs at all. Is it any wonder that they are unsalable?"

"I have undertaken to inform you on the art of practical and profitable inventing which includes the making of commercially valuable inventions—inventions that will stand on all the four legs I have enumerated. The next question for us to consider is thus: What is a legally-recognized invention?"

"Law is the science in which the greatest powers of the understanding are applied to the greatest number of facts."—*Dr. S. Johnson.*

LESSON II.

The First Essential of a Commercially Valuable Invention.

"The first thing the inventor has to have is an invention that is an invention in the eye of the law—a legally-recognized invention—in order to be able to demand a patent and to hold the patent against all attempts at impeachment. All matters of law must of course be left to the skill and knowledge of the patent attorney. But the inventor must be able to judge of the legality of his invention before he has spent time in working it out to the point of submitting it to the patent attorney. Experience shows that in the absence of a clear understanding of the underlying principles governing patents and inventions, deplorably many costly and harrowing blunders are committed by inventors against which I am solicitous to guard you. I will therefore reduce the gist of the patent law, in so far as respects the legality of the invention, to a single principle applicable to several kinds of inventions. By means of this principle, together with some exposition, you will, in a measure at least, be able to ascertain the legality of your inventions before you spend the necessary time to work them out and, as many inventors do, money in ordering applications filled for unpatentable inventions which will either

be rejected by the Patent Office or, if passed, the patent will be canceled by the courts.

“Inventing is the act of advancing the useful arts for the reward the Government is offering—the *Patent*. The useful arts comprise all sorts of processes and products; that is to say, processes for manufacturing things and things capable of being manufactured by some process. That process may be a mechanical process, a chemical process, an electrical process, a manual process, or a combination of two or more of these processes, but the invention must be capable of being manufactured by some process. Any invention or discovery that is neither a process for manufacturing a thing nor a product of some process of manufacture is not a patentable invention, as it does not advance the useful arts. For this reason the mere principle of a new machine, apparatus, or process; the mere discovery of a new law in nature, a new mineral, or a new gaseous substance; the eduction of a new system of bookkeeping, a new system of stenography, a new system of memorizing, a new system of mesmerizing, a new game, or a new trick is not a patentable invention or discovery, as it is not capable of being manufactured by any process of manufacture. The means and mechanisms of the new machine or apparatus; the instrumentalities employed in utilizing the new law in nature, the new mineral, or the new gas; or the implements employed in playing the new game or performing the new trick, are, of course, patentable, because they are capable of being manufactured by some process of manufacture.

“The arts are advanced either by conceiving new and useful functions heretofore unknown and mechanical means for performing the same, or by conceiving new and useful improvements on things already known; the improvements containing principles of construction here-

tofore either wholly unknown, or unknown only in that particular art.

“By conceiving a new and useful function and the means for performing the same, or a new and useful improvement on a thing performing a well known function, the inventor creates a machine, device, or thing heretofore unknown and thereby he advances the state of that particular art one step forward. For instance, by reconstructing the ordinary sewing machine so as to produce a sewing machine especially adapted to sewing up rents in, or sewing patches on, the welt of a finished shoe, the art of mechanical sewing is advanced to the extent that the sewing machine becomes of service to the shoemaker as well as to the tailor. By inventing an attachment, a darning attachment, for instance, to the sewing machine, the art of mechanical sewing is advanced to the extent that the sewing machine becomes available for darning as well as for sewing.

“But the arts may be advanced in a much less conspicuous manner—indeed, in the most inconspicuous manner. So long as the act of advancing the art is the result of exercise of the inventive faculty, the improvement, however simple and insignificant it may seem, is an invention in the eye of the law. As the act of advancing the art must be the result of exercise of the inventive faculty, not of mere common sense, it becomes of consequence to know the difference between inventive ingenuity and common sense.

“To make the bight of the ordinary hair pin, we discussed yesterday, larger, in order to take in more hairs, or to make the limbs of the hair pin shorter, in order to be able to pin short hairs, or to make the hair pin out of celluloid instead of iron wire, would be an act resulting from the exercise of common sense and therefore not a patentable invention. However great an advantage

the mere change in the dimensions of a thing may effect, it is not a patentable invention, because a change of such a nature is the result of exercise of mechanical judgment, not of the exercise of the inventive faculty. But to make kinks in the limbs of a hair pin in order to prevent its slipping out easily, requires the exercise of the inventive faculty, as the inventor must first conceive the new and useful function—the idea of providing means for preventing the hair pin from slipping out easily—and then the means—the kinks in the limbs which make the new function, or result, available for practical use. Kinking the limbs in a hair pin is a change in the construction, not in the dimension, of the hair pin, and such a change enunciates a new principle in the art of hair pin construction, and this new principle creates a new article of manufacture—a hair pin possessing characteristics heretofore unknown.

“The gist of the patent law on the subject of invention is thus: Any new and useful function that is the result of a change in the structure of a thing, however slight that change may be, so long it is of a nature that required the exercise of the inventive faculty to educe it, is a patentable invention. The new function, result, or principle by itself, as previously stated, is not patentable, but it is patentable under the entity of the change that brought it into, or made it available for, practical use. In addition to the foregoing example of simple invention, the following few examples of patentable invention may serve as a criterion:

“A small hole in the perforated disk of a lamp burner, through which an ignited match may reach the lamp wick and thus enable the user to light the lamp without removing the chimney, has been patented. Kinks in hooks and eyes, in hat pins, in wire buckles, etc., have been patented. A piece of metal attached to the heel of

a shoe, a piece of metal attached to the tip of a shoe, a piece of metal attached to a shoe or corset lace, a piece of tin over the cork of a beer bottle, and all sorts of needles, buttons, pins, clasps, buckles, nails, rivets, staples, clips, tips, etc., have been patented. Large or intricate machinery, apparatuses, and devices are generally known to be patentable and, of course, need no illustration. I may, however, add that any new and useful reorganization, simplification, or modification of an old and well known machine or device, even if it does not perform a new function, if it enunciates new principles of construction and has, in consequence, a new mode of operation, it is a legally-recognized invention by reason of the new characteristics imparted thereto by the new mode of operation.

“Legality of invention is such a profound and intricate subject that not only do thousands of patent attorneys make grave mistakes, but even the Patent Office often errs in its judgment one way or the other. If you happen to have an invention to which the principle I laid down for you does not fit it exactly, don’t take any chances with it in deciding its status one way or the other, but submit it to a skillful patent attorney and be guided by his judgment.

“The useful arts include chemical compositions and configurations capable of reproduction by some process. In these, like in mechanical organizations, the arts are advanced by either consummate invention or mere improvement.

“Invention, as we have seen, is of two kinds, the invention of a new and useful function heretofore wholly unknown and the means for performing the same, and the invention of an improvement on a thing already in use or otherwise known to have already been invented.

“A marked improvement on a thing already in use is generally, so far as the remuneration of the inventor is concerned, if protected by a patent of proper stamina, more certain of immediate financial success than the invention of a brand new thing or device. To introduce a consummately original process, machine, or thing requires a great deal of capital, many years of time to demonstrate its merits, and time and expense to educate the people to it, while to introduce an improvement on a thing already in use does not. Every useful improvement on things already in use is hailed with delight by the users of that thing and eagerly sought after by the manufacturers of that thing. Fortune by improvement being thus the line of least resistance, we shall devote our attention to improvements on things already in use.”

"If little labor, little are our gains,
Man's fortunes are according to his pains."
—Herrick."

LESSON III.

The Second Essential of a Commercially Valuable Invention.

"To win fortune by inventing, the aspirant must endeavor to acquire a monopoly in something that the people either need [must have] or want [wish to have]. A monopoly in something that the people do not want is, of course, worthless. As an example of commercially desirable and undesirable invention, experience shows that the people need all kinds of article-vending machines and want all kinds of amusement-vending machines, but have no need of a toilet-paper vending machine [one of the countless of undesirable inventions patented]. Wherever a public toilet room is installed, the munificent installators are generous enough to furnish the necessary toilet paper. A patent on a toilet-paper vending machine is in consequence a monopoly in something the people do not need.

"The people, it must be borne in mind, never know what they need or want. It is the inventor's business to find out what things that are not yet in use the people might need or want. Indeed the people never need nor want anything until the thing is put on the market. Then, if the thing put on the market is something they either need or want, they want it badly and gladly pay for it generously. Before the invention of the fountain pen

and the thousands upon thousands of indispensable things now in common use, the people did not know that they needed a fountain pen or any of the thousands of things they now could not do without. Before the invention of the accordion and the thousands upon thousands of amusing and entertaining things now in common use, the people did not know that they wanted such things. And since it is the inventor's business to find out what the people need or want, the first thing the inventor has to learn is how to discover a subject for inventing that when invented and put on the market the people will either need or want.

"Needs or wants of the people are often discovered by mere chance or accident. But the ambitious inventor must have a definite system of aggression and reach out for new needs or wants, as the chance or accident may never happen to him.

"Studious observation, thoughtful introspection, and judicious analysis are the means by the aid of which a public need or want is readily discovered wherever one exists.

"At the present stage of our industrial progress the inventor can do little more than invent improvements on things already in use. At any rate, to begin with, we will try a simple improvement on a thing already in use.

"Drive this twelve penny nail through these two boards, Joseph, and nip off the projecting end with these brand new, full size, standard wire-cutting nippers," I ordered the lad as I handed him two boards, a nail, a hammer, and a pair of nippers I had at hand for this purpose.

"Do the same, William.

"Now you do it, Miss Sharp.

"Very well.

"As I am seeking to discover a necessity for improvement, I was intently watching every movement of your

hands while you were nipping off the nail ends and observed that even Joseph, who is a mechanic and in consequence is always exercising his muscles, exerted undue squeezing force on the handles of the nippers in his effort to nip off the nail end. Miss Sharp could not do it at all. She only nicked the nail end and hit it with the nippers to and fro until it broke off. You may make it a rule for your guidance that anything that is made to be operated or actuated [not wielded like an ax or a sledge hammer] by human power or muscular force must be so constructed as to enable even grown children to use it with ease and facility. If the tool, device, or machine designed to be operated by muscular force or body power is not so constructed that even children of fifteen years of age can use it with ease and facility, there is need of making it so, even though women and children do not use such things at the present.

"The bicycle, for example, in its early stage could not be propelled by any person but a strong man. It was then a foregone conclusion that bicycles were for men only. No one ever dreamed that the bicycle would ever be used by women and children. But once it was adapted to their use it came to be used by women and children. The sewing machine is another example, and there are now hundreds of tools and machines used by women and children that before required the power and muscle of strong men to use them. Now, if these cutting nippers were reconstructed so as to make them cut with ease in the hands of delicate men and even women and children, there are jewelers, watchmakers, parasol makers, printers, milliners, artificial flower makers and householders that have occasional use for nippers to cut off a wire about the size of a twelve penny nail. The improvement would thus extend the use of

the cutting nippers and in consequence be a lucrative invention.

“Thus, whenever a tool, device, or machine actuated or operated by human power or muscular force is not so constructed that grown children can use it with ease, the making it so is a public need. In the present instance we have, by means of close observation and an analytical survey of the financial possibilities of the needed improvement, discovered a necessity for reconstructing the nippers so as to make them cut with less squeezing force. The discovery of this function, or result, is the foundation of a commercially desirable invention. The invention, it is true, is yet to be made. But the discovery of the public need or want is in countless instances more difficult than the making of the invention to supply that need or want, particularly so in small and simple inventions or improvements, as we will see later.

"We cannot know anything of Nature but by an analysis of its true initial causes; till we know the first springs of natural motions, we are still but ignorants."—*Clanville*.

LESSON IV.

How to Do the Inventing.

"Having conceived the idea that the cutting nippers need improving, and that the result to be attained is to make them cut with less squeezing force, we proceed to trace the effects to the causes. The fact that the nippers require great squeezing force to make them cut off the nail end proves conclusively that there is a faulty performer of a function somewhere in their constituency. In order to detect the faulty performer of a function in anything that is actuated by human power or muscle we must trace first, the movement of the hands or feet required to use the thing; second, the function or functions the thing is thus made to perform; and third, the operative principle of the thing; that is to say, that which makes the thing perform the final result under the influence of such movements of the hands or feet.

"Let us now resolve these nippers into their component parts and proceed to detect the faulty performer of the function in nipping off the nail ends.

"*THE MOVEMENT*—To effect cutting, the handles of the nippers must be squeezed in one hand.

"*THE FUNCTION*—The two jaws bite and sever the nail.

"*THE OPERATIVE PRINCIPLE*—The converging of the two handles of the nippers forces the jaws to bite

the nail; the more the handles converge the deeper is the bite.

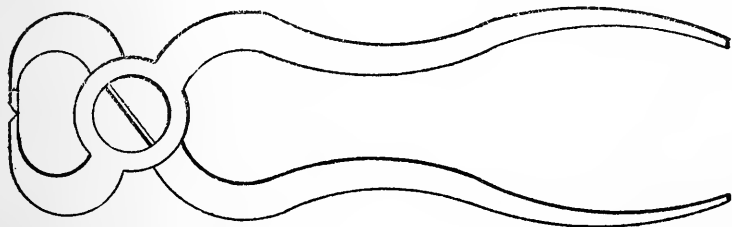
"The movement we see at once is unalterable.

"The function, or the final result, is always immutable.

"The operative principle, too, appears to be faultless; the more the handles converge the deeper is the bite, only our hands are not strong enough to converge the handles sufficiently for the jaws to bite off the nail end.

"Let us now analyze the structural features of the nippers and see where a change could be made that would result in making the nippers cut with less squeezing force and thus accommodate them to the muscular action of the various users' tender hands.

"What do the nippers consist of?



"Two metal bars, each curved and sharpened to a knife edge at one end, crossed and jointed loosely near the curved and sharpened ends.

"Why are the two bars crossed and jointed at the curved and sharpened ends?

"X—

"Hold one of the handles of the nippers in your left hand and with your right hand move the free handle upward and let it drop from its own weight. What does the free handle resemble?

"A lever of the first order fulcrumed on the rivet near its curved and sharpened end.

"Now why are the two levers fulcrumed near the curved and sharpened ends?

"For the purpose of obtaining greater leverage in the handles. The nearer the fulcrum is to the resistance the greater is the leverage; the greater the leverage the less force is required to make the jaws bite.

"Then it is the leverage that makes the nippers bite!

"It is obvious that if the handles of the nippers were twice the length they now are, the nippers would cut in the goldsmith's hand as readily as they do in the blacksmith's. But lengthening the handles would make the nippers heavier and the handles more divergent, and thus clumsy and awkward, if not at all impossible, to handle.

"We have now found out the fault and also the remedy. But the remedy, while it would cure the fault to perfection, is more objectionable perhaps than the fault itself, as it resolves itself into undesirable clumsiness and awkwardness.

"Gears and screws are mechanical substitutes for leverage, but none of these can be used in the present instance. What we must have is leverage without long levers. What do you suggest, Joseph?"

"I can think of no way of obtaining leverage with short levers," answered the lad listlessly.

"What do you say, William?"

Smiling embarrassed. "Ask me something easier, uncle. If Joseph, who is a mechanic, does not know how to obtain long levers with short ones, you surely don't expect me to know it. I suppose you will prescribe for us a course of study of certain books on mechanics. At the present I am as green as a persimmon. I have not the slightest knowledge of mechanics."

"Neither have I," interjected Miss Sharp, with an air of disappointment in her mien. "I guess Joseph will be more benefited by the lessons than either of us. He knows all about machinery and we will have to learn something of mechanics out of books."

"Brawn and brain are two widely different forces," I returned. "The machinist bears the same relation to the inventor as the carpenter does to the architect or the soldier to the general. The latter plans and the former executes. The inventor's training is entirely different from that of the machinist's. The most skillful machinist, if he is not either a born or a trained inventor, cannot invent. I have undertaken to inform you on the art of inventing and will show you how to acquire the necessary knowledge of practical mechanics."

"From mine eyes my knowledge I derive."—*Shakespeare.*

LESSON V.

How to Acquire Working Knowledge of Practical Mechanics.

APPLIED MECHANICS.

"Every intelligent man or woman has at his or her elbow a leafless volume of mechanical principles which he or she may study with great interest and pleasure and without the loss of time every hour of the day; and, if occupied with manual labor, during working hours as well. This leafless volume of practical mechanics when mastered is sufficient knowledge of mechanics for all practical purposes of the aspirant practical inventor.

"Every person living and moving in a civilized community operates mechanical devices almost every hour of the day. When we open or shut a door; lock or unlock a door; wind up a clock or a watch; turn on or off the gas; light a lamp; use a comb, a knife, a fork, a spoon, a pair of scissors, a carpet sweeper, a clothes wringer, a sewing machine, an ice cream freezer, etc., we operate mechanical devices. When we walk the streets of a city we see countless mechanical movements in operation. When we move our hands or feet we operate mechanical movements in our own physio-mechanical organization.

"The practical inventor must be thoroughly drilled in mechanics. In fact he must be a sort of pansophist—know everything. But he must gather his knowledge not

from books, but from studious and methodical observation and scrutiny of mechanisms in practical operation. And thus, what you need, at least to begin with, is not book study, but a few instructions and some information on mechanics leading to the acquirement of a working knowledge of mechanism from methodical and studious observation.

"We are learning to become practical inventors, and a practical inventor never abandons a feasible project. We have concluded that in the present instance no substitute for the lever can be employed. Yet, what we must have is leverage without long levers. Try to recall to mind incidents in your life in which you have seen the use of a lever and tell me of the most striking use; that is to say, a case out of the ordinary.

"Miss Sharp, I want you to take as much interest in the lesson as the young men do. You are just as likely to hit upon a good invention as any of us. Tell me what you know of the use of a lever."

"Hardly," smiling and blushing embarrassed. "But I listen attentively. I have seen a man raise a capsized wagon with a pole which is usually called a lever. I don't remember of having seen any other kind of lever."

"What do you know about the use of a lever, William?"

"I have seen levers in printing presses, but I don't understand their action. I have also seen a corner of our woodshed raised with a pole and a crowbar which I know are usually called levers, but I don't know of anything out of the ordinary."

"And you, Joseph?"

"I have seen all kinds of lifters and levers in machinery, and crowbars and such levers as are usually used about machinery, but I know of nothing out of the ordinary."

"The lever is the all important element in applied mechanics. A thorough knowledge of its action and application is therefore essential. I have no desire to bore you with an exhaustive explanation of the theory and practice of the lever, or tire you with mechanical erudition of any kind. Books on mechanics can be had everywhere, and at prices within the reach of all. To the advanced practical inventor book knowledge is helpful, though not essential. A brief and lucid exposition of the practical phase of the lever, its action, its varieties, and its application is, in my opinion, all you need for all practical purposes of mechanical inventing.

"The principle of the lever is the basis of the greater part of all the mechanism in practical use. I shall therefore illustrate its action and its practical application with sketches and give some examples of the lever in practical use.

"The paramount principles upon which practically all the known mechanical movements operate are two: The lever and the inclined plane. The principle of the lever is the fundamental principle of the pulley and the wheel and axle; that of the inclined plane is the fundamental principle of the screw and the wedge.

"The lever is a rigid bar held rockably on an unyielding body, called the fulcrum. The lever is used to augment the power required to move or raise a given weight. The value of the lever as a mechanical power depends upon the position of the fulcrum in relation to the weight to be raised. Power is applied to one end of the lever to overbalance the weight it is required to raise or move, just as in the use of a pair of balance scales. But in the case of balance scales, the fulcrum being in the middle of the cross bar, the power is equal to the weight. The balance bar cannot therefore be termed a lever, because by the term lever we understand a mechanical

purchase or power. But the steel yard can. The steel yard is a lever. A mechanical power. Because in its normal condition the ball at the end does not equal the weight it overbalances. It is the disposition of the fulcrum, or in modern steel yards the disposition of the power [the movable weight], in relation to the fulcrum that causes the ball of the steel yard to overbalance the weight.

“There are three kinds of levers. To facilitate elucidation I will sketch them out for you and mark them consecutively.

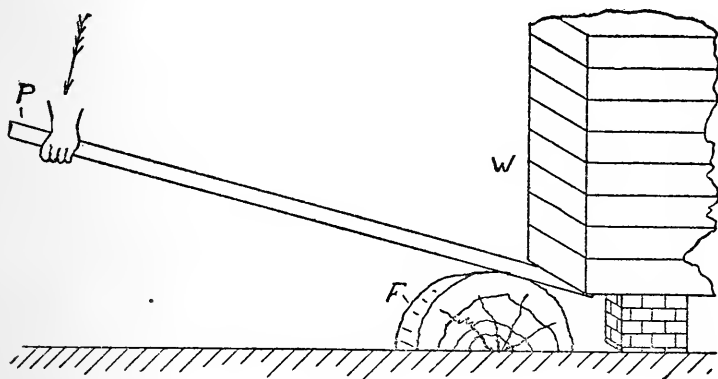


FIG 1.

“The lever marked Fig. 1 is termed a lever of the first order. This arrangement is the most powerful of levers. The weight W , represented by a corner of a woodshed, is overbalanced by placing the fulcrum F as close to it as it is possible and bearing or pulling downward the opposite end of the lever at P , which denotes power, as indicated by the arrow.

"The lever marked Fig. 2 is termed a lever of the second order. This lever uses the ground G for a ful-

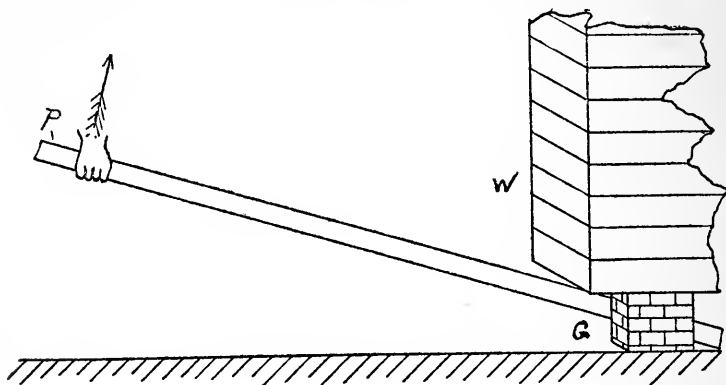


FIG. 2.

crum and the opposite end of the lever is pulled upward, as indicated by the arrow.

"The lever marked Fig. 3 is termed a lever of the third order. This lever uses for a fulcrum another building or object B at the opposite end, which must be of greater weight than the weight to be raised, and is pulled upward about in the middle. This is the poorest, or

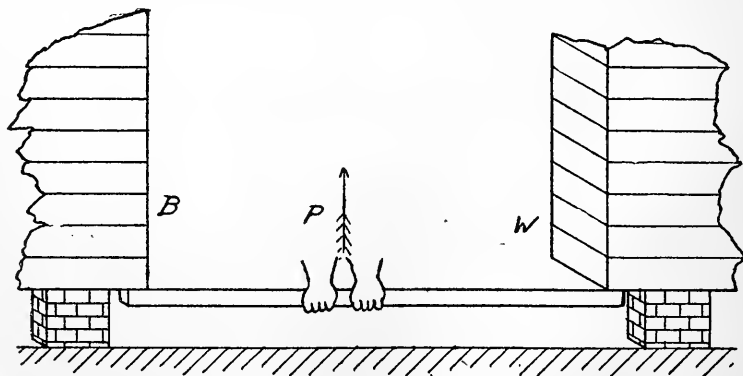


FIG. 3.

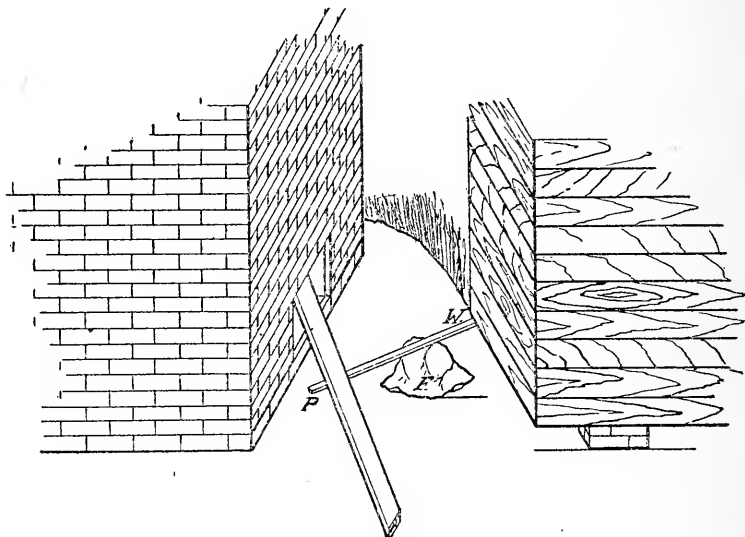
most inefficient, form of lever. But it has its uses where—until the inventor shakes the theory—neither of the other two kinds can be employed.

“When we pull a nail with a claw hammer or with a pair of tongs we are using a lever of the first order; the curve in the hammer or in the tongs being the fulcrum. When we remove the metal cap from a beer bottle with the regular beer bottle opener or open a tomato can with the usual can opener, we use a lever of the second order. When we carry a spadeful of dirt, or a shovelful of coal, or lift a stove lid with a lifter we are using a lever of the third order. Thus, the lever, even in its rudimentary forms, constitutes an important element in practical mechanics and is used extensively in every home, office and works, and by every active person perhaps every hour of the day.

“You have seen many levers and peculiar uses of the lever, also numerous mechanical movements in operation containing levers from which you could have derived mechanical knowledge enough to solve the present problem in a few minutes; but, as you were not practicing inventing, you, like every other person not an aspirant inventor, paid no attention to them and of course cannot be expected to solve the present problem with facility. But with your present understanding of the principles of the lever I have just conveyed to you, and a little judicious retrospection you may be able to recall to mind a certain peculiar use of the lever you may have once seen.”

“I remember now a peculiar use of the lever I have once seen,” exclaimed my nephew triumphantly after a few moments of thoughtful retrospection. “I once watched two men raise the corner of our shed. I saw they inserted a pole under the sill and tried to raise the shed by pulling the pole upward. This, I now understand, is a lever of the second order which, sure enough, was ineffective. Next they brought a rock which they employed for a fulcrum and used the pole in the manner

of a lever of the first order, bearing down on its opposite end; still could not budge the shed. One of the men then tried a scheme which worked nicely. He substituted for the wooden pole an iron crowbar, which was considerably shorter than the pole, and then used the free end of the crowbar for a fulcrum for the wooden pole like this,



and up went the shed."

"There you have it. This teaches us that a lever acting upon a lever—which is technically termed a compound lever—augments the power of the lever without increasing its length. This is just what we are looking for!

"Now take this problem home, digest the lesson you have learned this evening, and then work out the problem by applying the principle of the two levers to the nippers. Assemble here tomorrow evening at 5.30 with problem solved. Make your sketches as neat as you can."

“Thought is deeper than all speech;
Feeling deeper than all thought;
Souls to souls can never teach
What unto themselves was taught.”

—Cranch.

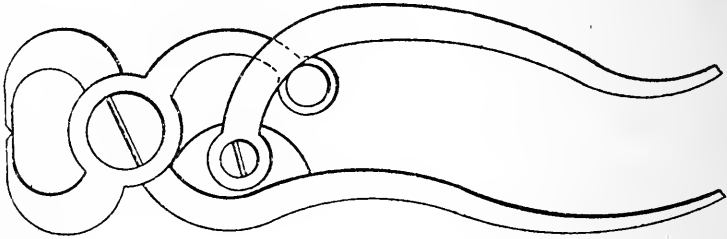
LESSON VI.

The Knack of Practical Inventing.

Scanning the faces of my three pupils as they assembled on the evening of the following day for the second session, I noticed that Joseph's eyes were dancing, trundling, and gleaming luminously with the fire of an overwhelming triumphant achievement, while his sister's seemed nonchalant and William's somewhat apprehensive. Joseph's entire frame shook. His jaw vibrated and his lips quivered from anxiety to unload his burden of joy and receive the reward of commendation, admiration, and praise. But as he, being a machinist, had some advantage over the others, I called on his sister first. Miss Sharp produced a sketch, looked askance at my nephew, and smiling pleasantly remarked very modestly:

“I have studied last night's lessons thoughtfully and applied the principle of the two levers to the cutting nippers.” Darting a furtive glance at her admirer and noticing a high tension on his facial indexes—evidently from fear of being surpassed—she resumed: “I have now hopes to become an inventor some day. My application of the principle of the two levers to the nippers may be crude and impracticable, but at the present it appears to me it is the only way possible to apply the principle of

a lever acting upon a lever and I am proud of my mental production even though it is crude and very primitive in its design. Here it is."



"Why do you now hope to become an inventor, Miss Sharp? You doubted it yesterday."

Blushing and casting furtive glances at the young men. "Things look quite different to me today than what they did yesterday. When, this morning, I carried a spoonful of oatmeal to my mouth, I knew I was operating a lever of the third order. When I depressed a typewriter key I knew I was operating an inverse lever of the second order. When I released the carriage of my No. 6 Remington, I knew I was operating a lever of the first order. And so in a number of things I handled to-day, I traced the leverage to one of the three forms of levers.

"It is owing to this tracing of the leverage of the things I see and handle every day that I have hopes to become a practical inventor. I admit, I seriously doubted it yesterday. When my powers of perception and conception will become trained by the constant application in the manner you suggested, and I have ascertained to be possible, and my mind will become stocked with the principles of the numerous mechanical movements I now see in operation on every step, I am sure I shall be able to make inventions. I will then know how to substitute

levers of the first order, which are most powerful, for levers of the second and third order, and thereby augment the effectiveness of things in common use. This, I now understand, is often invention. Moreover, my ability to apply the principles of the crossed poles to the cutting nippers, which at first seemed utterly impossible, inspired that hope in me."

"Excellent! A few months' spare time spent in such exercise will place you in possession of a course in applied mechanics which no money can buy nor the best school, college, or university teach. You will find the continuous practice of tracing the leverage of co-acting parts of everything you use, handle, or have occasion to inspect will afford you great pleasure and amusement and wholesome instruction in mechanics, and supply you with ample material for invention or improvement to select from the most feasible. With a little practice all the weak points of construction and all the faulty performers of functions in the things you thus scrutinize will float before your eyes like straws on a swift current, and opportunity for valuable invention will, in the nature of events, offer itself.

"Practical inventing is a knack. A knack, as the noun is defined in the dictionary, is a peculiar dexterity or aptness, usually acquired by long practice, that enables one to do a thing quickly and well. The knack of practical inventing, that enables the practical inventor to invent quickly and well, is acquired by pursuing the practice of tracing the leverage of co-acting parts of machinery one has occasion to use or see others use, and by tracing effects to their causes in the manner I have previously explained.

"The principle of the lever in one of its forms is present virtually in everything that is used. When a top is spinning a lever is in operation. Drive a nail partly into

the periphery of the top and you will increase its rotary force incident to the lengthening of one end of the lever. But while the lever is practically ubiquitous, it is not always apparent. For instance, when we turn up or down a lamp wick we operate a lever; when we turn a door knob we operate a lever; when we wind up a watch we operate a lever. These are rotary levers. The effectiveness of such levers depends upon the size of the knob by which the lever is turned. We scarcely use a single thing without operating either a lineal or a rotary lever of some kind.

“The benefits derived from tracing leverage and effects to their causes are many, but the following are the principal ones. In order to trace the leverage of co-acting parts we must studiously examine the shapes, forms, and positions of some parts in relation to others and mentally separate the various functions in the piece of mechanism. By tracing effects to their causes we learn methodically the various functions and the *modus operandi* of the mechanism and become familiar with the curves, lines, and forms of mechanical parts. With the one who adopts the practice of tracing leverage and effects to their causes it soon becomes a sort of a hobby, often a passion, that leads him mechanically to an extensive inspection of the principles of the mechanisms of an entire class.

“For instance, when we are sweeping with a broom and think of the leverage the operation affords us, we perceive that we are using a lever of the third order for which, knowing its ineffectiveness, we cultivate a dislike. Instantly, curiosity asserts itself and excites in us a desire to find out what is the rotary leverage of a carpet sweeper. Then, when we walk in the street and see the street sweeping cart, having some knowledge of the operative principles and of the leverage of the carpet

sweeper, we are naturally prompted to stop and inspect and to trace the leverage of the street sweeping machine. Next, when we see the street car snow-sweeper in operation, we stop to examine that machine and compare its principle of operation with those of the others. Then, when we conceive an improvement in a carpet sweeper we know, in a measure at least, what is in practical use in the class of rotary sweepers and quickly ascertain, by comparison, whether or not the function of our conception is new and unknown, whether or not our mechanical means is an equivalent of something that is already in existence, and whether or not our scheme is commercially desirable. We thus invent quickly and well.

“Another example of how such practice educates the aspirant practical inventor, suppose our subject of inspection is a door lock. We first try the two levers, the knob and the key, by which the latch and the bolt of the door lock are actuated. Introspecting into our feelings we find that the upper lever, the knob, moves the latch easily, while the lower lever, the key, offers some resistance and the bolt it moves produces a grating and snapping noise. If we know nothing of lock construction, our first impression is that as the knob is so much larger than the head of the key, the knob does, by reason of its greater leverage, move the latch so much easier than the key does the bolt. But as we aspire to become practical inventors we must take nothing for granted, but carefully verify our impressions. We remove the lock and unscrew the lid. Upon investigation we find that the movement of the bolt is impeded by a number of tumblers, and that when these are removed the bolt is moved by the key much easier than the latch is moved by the knob, notwithstanding the difference in the leverage, for the latch moves against the tension of a spring while the bolt does not. Next we study the action of the

tumblers and ascertain their function. We incidentally ascertain why the bit of the key is notched and recessed and thus become educated in lock construction.

"A thorough study of the class in which one undertakes to invent is imperatively essential. The study of an entire class of machines, devices, or things may be readily effected by visiting the stores where such machines, tools or devices are sold and inspecting those on sale. Such a study may be greatly enhanced by reading all obtainable catalogues, descriptive circulars, and advertisements of such machines, devices or things.

"The most propitious opportunity for lucrative inventing has the factory worker and every person engaged in the art of reproducing things by mechanical means. If you can make your printing press throw out every hour one or two thousand copies more than its present capacity or your type-setting machine produce one or two thousand ems more than its present capacity your success is assured. One who takes up this kind of inventing seriously may procure copies of the entire class of patents at a cost of a few dollars and thus keep posted on what has already been accomplished in that art and the trend of the inventors working that class."

"Tender handed grasp a nettle,
And it stings you for your pains;
Grasp it like a man of mettle,
And it soft as silk remains."

—*Aaron Hill.*

LESSON VII.

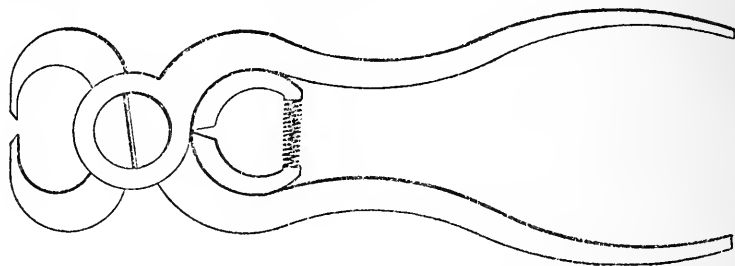
Comment on the Crude Model.

"How did you apply the principle of the crossed levers to the nippers, William?"

My nephew knew he had surpassed Miss Sharp, but feared Joseph's supremacy. He, being a machinist, must have achieved greater success in applying the principle of the crossed levers to the cutting nippers, William presupposed. Looking at Joseph suspiciously he answered protractedly in a faltering cadence: "I have studied last night's lesson thoughtfully, and during the past twenty-four hours I have traced the leverage of a large number of mechanisms and things I came across. I am really astonished at the knowledge of mechanics I have already acquired, yet I am not a trained machinist as my friend Joseph is. I fear that my makeshift is not much better than Miss Sharp's—and perhaps not as good," he added, fearing the young lady may take umbrage at the insinuation.

"It occurred to me that since there are two levers to the nippers it might be better to have them both of the

same capacity, so I hinged all of the four levers on one fulcrum as shown in this sketch.



"As I am not a mechanic I was not sure this scheme would work right, so I made a pair of nippers out of a shingle to ascertain the operativeness and the feasibility of my scheme. This is my model. It is very frail but it works all right."

"Well done, William." I tapped him on the shoulder approvingly. "The inventive faculty, you see, is held in us under tension. It needs but a slight jolt to make it leap up. You are more of an inventor than you were willing to believe you were."

Presupposing Joseph had something still more wonderful I did not wait to inspect his scheme, which I thought would surely eclipse all others, but first complimented my two humble pupils on their inventive achievements, which though crude and impractical were certainly commendable, considering the briefness and the incompleteness of the previous lessons.

I especially praised and commended my nephew for his wisdom in making a wooden model to demonstrate the operativeness of his invention. For the new beginner, or until one has had a few months practice in tracing leverage, this is certainly an excellent plan and worthy of emulation. It inspires the aspirant practical inventor with confidence in his creation. The model made out of a shingle, frail as it was, showed up the operativeness

and the practicability of his invention nicely, and imbued the aspirant practical inventor with faith in his ability to create something new, operative, practical and desirable.

"Joseph, you have some advantage over your co-learners. You are a mechanic. You must have something real pretty," I remarked as I turned my attention to him.

"That's right. I'm a mechanic. I don't have to learn how to invent. I simply like to listen. I did not want to fool with these old nippers. I have invented a flying machine that beats the Wright Brothers' biplane all hollow." He pouted excitedly as he jumped to his feet and poked the sketch of the flying machine he held in his trembling hands.

I chuckled down my disappointment. I took the sketch from his hand and put it under a paperweight without looking at it or commenting on it. His sister, noticing my disappointment and displeasure, blushed and looked at the precocious inventor incensed. To relieve both of their embarrassment, I said: "I will look at the sketch later when we come to the subject of flying machines."

Turning to the other two tyros I remarked: "You have certainly done well, considering the limited knowledge of inventing you have. This, however, is not due to your innate ingenuity, but to your eagerness to learn the art of inventing and your exercise of moral courage. Inventing is one thing and reducing conceptions to practice is quite another. The former cannot be taught, the latter can. Devising the shapes of the elements after the function and the general principles of the means for accomplishing the same have been conceived is like solving a mathematical problem. Any fairly intelligent boy or girl can solve an intricate mathematical problem which at first appears impossible. But some boys and girls have grit enough to try and work at it and finally solve it, while others have no patience to try or simply don't

want to exert themselves and, of course, they never attain proficiency in mathematics.

"But while, as a matter of fact, you have solved the problem and applied the principle of the crossed levers to the nippers, the inventor who had given his conception of improving the cutting nippers by means of compounded leverage more thought and study applied the principle of the compound lever in a more practical manner. In either of your devices the long lever is of the second order, while in the compound cutting nippers now on the market both the long and the short lever are of the first order.

"I have illustrated my first exposition on the art of improving on the cutting nippers because your mistakes in lineal levers, when pointed out to you, would be easily seen by you. In rotary levers, particularly in compound rotary levers, mistakes in their arrangement would not be so obvious to you.—"

"I never heard of compound rotary levers," interrupted Joseph.

"Why, the back gearing in the very screw cutting lathe you are using every day is in effect a rotary compound lever, and so is every speed-reducing gearing.

"There are thousands of patents in which the machines they show and describe seem practically inoperative and, of course, commercially valueless. A careful study of these machines discloses the fact that the new mechanical principles they enunciate are not only operative, but eminently practicable and of intrinsic commercial value. It is the confused distribution and promiscuous arrangement of the lineal and rotary levers in the machines that make them appear ineffective. To avoid such ruinous errors, drill yourselves very thoroughly in observing the proper distribution and arrangement of lineal and rotary levers in successful machines in operation.

“Practical inventing is a knack, practical patent making is a knack, practical mechanical skill is a knack, skill and proficiency in any art or profession is nothing but a knack—a thorough mastery of the art or profession. A knack in any art or profession can only be acquired by persistent, well-directed, determined efforts during the process of training. In every art and profession masters are very scarce, because so few are willing to make the determined effort necessary to the attainment of proficiency.

“He who aspires to win fortune by inventing must master the arts of observation, introspection and analysis. These arts can be best acquired through the constant practice of tracing the leverage of co-acting parts in machinery, and causes to effects in everything. With a thorough mastery of the arts of studious observation, introspection and analysis, conceptions of masterful reorganizations of machinery or combinations of effects in almost everything are bound to follow every ardent attempt.

"No man possesses a genius so commanding that he can attain eminence, unless a subject suited to his talents should present itself and opportunity occur for their developments."

—*Pliny.*

LESSON VIII.

Labor Saving Machinery.

"Another phase of practical and profitable inventing is the act of contriving mechanical means conducive to supplant manual labor either in part or in whole.

"The following example will demonstrate the conditions most propitious to such inventing and the important points that claim the inventor's thoughtful deliberation. The earnest inventor must always be on the alert and ever ready and eager to avail himself of every promising opportunity for profitable inventing.

"Strolling through the woods in a lumber region I was attracted by the sight of two men buckling over a thirty-inch-in-diameter knotty oak log, diligently fiddling a cross-cut saw from sunrise to sundown, and all they had accomplished that day was to cut five or six of these logs in two. The work of sawing such logs is very fatiguing and the pay is only one dollar a day per man. I addressed the men: 'Good people, why don't you buy a machine with a rotary saw which would cut that log through in less than an hour instead of wearing yourselves out and losing so much time?'

"'We should certainly like to have a machine that would do this kind of work for us,' one of the men answered. 'The work is very hard on us; it is certainly

wearing us out. But a machine to cut such logs must carry a six-foot-in-diameter circular saw.'

"Well, what of that?"

"Oh, what of that! A machine that carries a six-foot-in-diameter saw requires a twenty-five or thirty horse power engine to drive it."

"Suppose it does!"

"Suppose it does!" reverberated one of the men. 'Why a thirty horse-power engine requires an engineer to tend it and a large building wherein to keep the engine and the machine. All the logs would then have to be brought to the machine. That would require the maintenance of a number of teams and teamsters for that purpose. Such an outfit would cost several thousands of dollars and we are poor men, working for a dollar a day. How dare we think of such a thing? Moreover, circular saws are very expensive and subject to break with the best of care. A six-foot-in-diameter circular saw costs about one hundred dollars, while the best cross-cut saw costs only two dollars; it never breaks and is portable.'

"Deliberating on the subject and conceiving the idea, I asked the men: 'How much would you be willing to pay for a machine that one of you could conveniently handle and accomplish in a day as much as you two do?'

"The men conferred in a whisper and figured out that such a machine would certainly be of excellent assistance to them. It would save them a dollar a day, and that means about three hundred dollars a year. Such a machine would be worth a great deal to them, but as they are poor men they could not invest much money no matter how great a saving the machine may effect and therefore refused to answer me. Finally, as I pressed them for an answer one of the men responded: 'I'll tell you, mister, such a machine would be worth a great deal to us, but as we are poor men we could not, to save

our souls, scrape together more than fifty dollars. This sum is all such poor men as we are could invest in such a machine even though its service, to tell the truth, would be worth to us about three hundred dollars a year.'

"Here is a problem for us to solve. We must invent a machine that, although it would save the purchaser about three hundred dollars a year and last a life time must be made to sell for fifty dollars.

"In a machine of this kind the inventor should have a royalty of at least 10 per cent, or five dollars, on every machine made. The manufacturer, for his cash investment, his time, and the depreciation of his machinery, deterioration of his buildings, etc., must make a profit of at least 30 per cent, or fifteen dollars, in a machine. To let the woodsmen of the country know that the manufacturer has such a machine for them, competent agents must travel through the woods on teams to interview the woodsmen in all parts of the country and secure from them orders for the machine. The expense of maintaining such agents, the advertising matter, the cost of boxing and delivering the machine to the freight station and other incidental expenses connected with such an enterprise would amount to about 50 per cent, or twenty-five dollars, on each machine sold. So, our invention, to be a commercial success, the machine must not cost over five dollars to manufacture. Yet the machine must be conveniently operated by only one man and do the work of two men.

"Would it pay to invent such a machine?

"Well, yes. There are about one hundred thousand woodsmen in this country. If we are fortunate enough to place our invention in the hands of a wide-awake, progressive manufacturer, he should, during the life of our patent [seventeen years] sell machines to at least one-half of the number of woodsmen in this country.

We would then net a royalty of about a quarter of a million dollars during the life of the patent.

"What competition is there in the field?"

"The costly rotary steam-driven sawing machines. As they stand in relation to the machine we have in mind as the automobile does to the push cart, they need not be taken into consideration. There is no one-man-operated log sawing machine on the market that sells at fifty dollars. The field is therefore clear.

"Having decided that the invention, if successfully carried out to fill all conditions, would be a commercial success, let us proceed to invent the machine. Jot down the problem, Miss Sharp:

1. "Our machine must perform two functions. It must move the cross-cut saw rectilinearly reciprocal [to and fro in a straight horizontal line] and must feed the saw into the cut at every backward movement the depth of about two-thirds of the height of a saw tooth;

2. "Our machine must supply one man-power and the operator must manipulate it with perfect freedom of movement, not buckle over the log as before;

3. "Our machine must be rigid and stationary, yet be light and portable enough to enable the operators to cart it through the woods;

4. "Our machine must not cost over five dollars to manufacture, unless we are in a position to do our own manufacturing and marketing.

"The first move toward solving our problem is to select, from the store in our mind, some mechanical movement which we have seen in operation, and deem it practical for the purpose, that will give us a to-and-fro horizontal movement of the cross-cut saw. What do you suggest, Joseph?"

"Why, an eccentric would do that! An eccentric moves the piston of an engine to and fro."

"Yes, an eccentric in a yoke, or crank in a shaft, which is the same in principle, generates a reciprocally rectilinear movement of the piston or implement moved thereby. But our saw must move at least thirty-six inches forward and thirty-six inches backward in a straight line. Thus, an eccentric or a cranked shaft would require a lateral space of six feet to accommodate its throw in all directions. It would also require means for preventing the saw from following the circular movement of the eccentric, which we must avoid on account of the cost. The eccentric or the cranked shaft are therefore impracticable for the present purpose. Let us think of something cheaper and more compact. What do you say, William?"

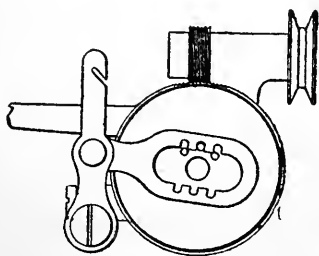
"Why, as I walked through the street this morning I stopped to examine the mechanism under the body of a coal wagon which was raised and lowered a distance of about thirty-six inches by means of a rack and pinion. The shaft carrying the pinion was turned by a crank. The movement I figured out was a lever of the first order. Why would not such an arrangement do for moving the cross-cut saw horizontally?"

"Yes, a rack and a pinion on a driven shaft would move the saw the required distance in one direction. What about moving it in the opposite direction? Reversing the movement of the crank won't do. What do you suggest, Miss Sharp?"

Smiling, blushing, and blinking with a tinge of exhilaration in her mien, she began gingerly: "Last night as I studied my lesson I examined among other things my New Home sewing machine. The movement of the bobbin winder somehow held my attention longer than any other part of the machine. I used that bobbin winder

for nearly three years, yet if you had asked me yesterday what the thing looked like I would have been unable to give an intelligent description even of its external appearance, for I never looked at it before. Last night as I examined it and wound a bobbin with it for the purpose of observing its action, the graceful reciprocal movements of the thread guide and its evenly depositing the thread on the bobbin amused me greatly. The recondite mechanism of the horizontally movable arm excited my curiosity to the point of tempting me to unscrew it and find out what makes the thing move so silently and gracefully to and fro with such remarkable regularity, and I unscrewed it. When I took down the analysis of the problem of the cross-cut log-sawing machine it flashed across my mind that the horizontal movement of the bobbin winder arm would be just the thing for moving the cross-cut saw reciprocally in a horizontal line."

"Sketch out the bobbin winder, Miss Sharp, please, to let the young men see what the thing looks like and tell us, if you can, how you would apply the principle of the bobbin winder to the log-sawing machine."



Miss Sharp sketched this view, studied it a few minutes and emitted a self-pleased "hm." She referred to the

note book and said: "Our problem calls for one man-power. We have an old straw cutting machine in the cellar with which we used to cut hay for the cow. I examined it this morning. As the machine is not in use, the fly wheel is now off. When, this morning, I tried to turn the crank I could not budge it, whereas when the fly wheel was on I could turn the knives and feed the rollers and cut the hay as easily as Joseph did. It just occurred to me that the fly wheel supplied the power to operate this machine. As our problem calls for one-man power I think a fly wheel would supply that. I should convert this worm wheel of the bobbin winder into a fly wheel of suitable weight and diameter, and turn the wheel with a crank. Just how to arrange this mechanism I cannot tell at the present, but it is plain that the reciprocally-movable, oppositely-disposed rack bars of the bobbin winder, made of suitable material and proper dimensions, would move the cross-cut saw to and fro in a horizontal line."

"Excellent! Your mechanical movement is well chosen for the purpose, Miss Sharp. I did not expect you to apply the principle of the bobbin winder to the log-sawing machine without considerable study and speculation, but wished to know what disposition you would make of the slow-driving endless screw and wheel.

"A fly wheel does not generate power, it merely stores up the power imparted thereto and pays it out gradually. The first few turns of the crank imparts momentum to the wheel; it then requires considerably less effort to keep up the turning of the crank. Yes, a fly wheel of suitable diameter and weight will supply the one-man power.

"Now we have a good driving mechanism, what about feeding the saw into the cut?"

"Oh, that's nothing," answered Joseph quickly. "Drill presses, planers, etc., feed the tool into the cut by a ratchet and pawl upon a screw."

"Well, then, we have the operative principle of the machine. Next we must reduce our invention to practice.

"I wish to remark right here that the conceiving of the function and contriving the operative principles of the machine to perform that function, is the invention proper. The rest of the work, that is, the mechanical work of embodying the principles of the mechanism in a workable machine; or, what is popularly called to design the machine and embody the principle of the invention, though it is important to the completion of the invention, is not an essential part thereof.

"Suppose, for example, that owing to lack of knowledge of machine construction, or machine design, we were unable to complete our log-sawing machine ourselves. We may employ a machine designer, a draftsman, a mechanic, or an inventor to do that for us without losing the inventorship of the invention. We may even with propriety avail ourselves of important suggestions or improvements in the principles proper, so long as they constitute no deviations from the scope and spirit of the new function; or, if the invention is a mere improvement on a machine already in existence, from our new *modus operandi*. The rule of law is that the first inventor is entitled to a patent for the conception of the new principle and therefore to all improvements thereon made by others at his request. If, however, an inventor conceives a new function and the operative principles of the machine to perform that function, and does not have the invention reduced to practice, but carries the idea in his mind, and if a few weeks or even a few days later another inventor conceives the same idea, has the new principle properly clothed with a material body, and applies for a patent therefor, the latter inventor will be adjudged to be the first, sole and original inventor of the

machine, notwithstanding the fact that another inventor invented it first, as the first inventor would have no means of proving priority.

"Due diligence is therefore of the utmost importance. The new principle should be at once embodied in the machine [on paper], with or without the assistance of others, and the patent applied for so soon as practicable. Models, except when a mechanism is so poorly illustrated and so ambiguously described as to appear inoperative, or actually is inoperative, are not now required by the Patent Office, and no investment in a working model should be made until the patent is allowed."

"Why not have a working model made before the patent is allowed?"

"For this reason: A model of the simplest piece of mechanism often costs several hundred dollars to produce, and if the patent is rejected the investment therein is sheer loss. With the exception of a cheap, crude, wooden, paper, or metal model—one that is just sufficient to demonstrate the principle of the invention, its operativeness, or its feasibility, in cases where such demonstration is deemed expedient—make no further investment in an invention beyond the cost of filing an application for a patent, and that only not until a thorough preliminary examination by a skillful patent attorney has been made of the patent records in the class to which your invention appertains, until the patent is officially allowed."

"But some patent attorneys guarantee issue of the patent," protested Joseph Sharp. "What's the use of waiting several months for the allowance of the patent when you know that the patent will surely be issued? It would be a sheer loss of valuable time. I could have the model of my flying machine built and tested by the time my patent is allowed." Joseph later confessed that on the morning following the incident recorded in Part I, not

knowing that he would be invited to join my nephew in the lessons, he had made the rounds of several of the large patent-shoving companies and collected a lot of client-hatching literature from which he inferred that the disseminators guarantee issue of the patent.

Most of the books and booklets distributed gratis among inventors seem to impress the readers with the idea that all one needs is a patent and fortune is his. As a matter of fact, a patent possesses no more controlling virtue than the block of wood or stone of which the Chinese Joss is hewn does divine virtue. It is the skillful preparation of the specification and claims in the patent that imparts the monopolistic virility that is of intrinsic commercial value in the patent.

No power on earth can guarantee issue or allowance of the patent; but the worse kind of a botch of a patent attorney can guarantee allowance of a patent. As the tyros had not yet learned to distinguish the difference between one patent and another, I ignored Joseph's remark and repeated: "Beyond the cost of filing the application for the patent, make no further investment in your invention until the patent is officially allowed, and then only provided the allowed patent covers enough of the invention to justify the investment in the cost of a working model.

"Crudities may be eliminated after the patent is issued, and advanced ideas, if they enunciate new principles, are always better protected by an additional patent. Shapes, forms, proportions, or dimensions do not figure in patent causes unless the invention is directly dependent on such. After the patent is issued the inventor may make his machine or device of any size, shape, or form he chooses different from what is shown in the drawings of the patent without in the least prejudicing his rights. There is therefore no reason why a model should be made before.

"Furthermore, the filing of an application for a patent is legally equivalent to reduction to practice in all contests for priority, and in many instances it carries more weight than a working model of even date.

"The law allows the inventor two years time in which to test the merits of his invention. Some inventors, particularly manufacturers, often even market their improvement before they apply for a patent. And some inventors, especially those who have patents of a nature that they contemplate procuring foreign patents, build models of their inventions and test their merits thoroughly before they apply for the domestic patent. But all those who do so must be prepared to fight costly interference cases. Those who are not wealthy enough to fight interferences should file their applications for patents before they invest in a model.

"Enormous sums of money are annually wasted by inventors against which I am solicitous to guard you. The average inventor seems to have no adequate idea of the chances he takes in making any considerable investment before the final allowance of the patent. The allowance of *a* patent is practically always certain, the allowance of *the* patent is positively never certain. Besides prior patents, there are publications in the Scientific Library of the Patent Office, caveats kept in the secret archives of the Patent Office, foreign patents, abandoned, forfeited and pending applications, "facts within the personal knowledge of an employee of the office"—causes for rejection which though not probable are always possible of being confronted with when a set of comprehensive, generic claims is presented and allowance vigorously urged.

"It is ordinarily safe to proceed with the building of the working model immediately after the second or third action on the merits of the invention under ex-

amination; that is to say, after the principal claims have been allowed in view of the citations on file. But the existence of a pending application for a similar invention cannot be discovered until one of the two co-pending applications is ready for final allowance. The proper course to pursue is obviously to wait with the building of the model until the application is finally allowed.

“To afford the inventor sufficient time to have applications for foreign patents prepared and filed before the publication of the American patent, he is allowed about twenty-one weeks’ time from the date of the official allowance of the application in which to order the issue of the patent. The proper time to build the model is during these twenty-one weeks. If during the building of the model some serious difficulties are encountered and more than twenty-one weeks’ time is required to eradicate some vital weaknesses or to correct the inoperativeness of certain features or functions of the new machine, the allowed application may be forfeited by simply not paying the final Government fee of \$20.00 at the expiration of the twenty-one weeks and renewed at a cost of a new first Government fee of \$15.00 so soon as the model is completed and tested or at any time within two years from the date of official allowance.

“Never order the issue of the patent if there is the slightest doubt as to the operativeness of a single feature or function, element or combination of elements in the machine as shown in the drawings and described in the specification of the allowed application; as the patent will be null and void.

“Now show your tastes and aptitudes in the designing of the frame work of the log-sawing machine and elaborate its mechanical movements in the most practical manner possible for you, and assemble here tomorrow at 5.30 p. m.”

"A woman is like to—but stay,
What a woman is like to, who can say?"

LESSON IX.

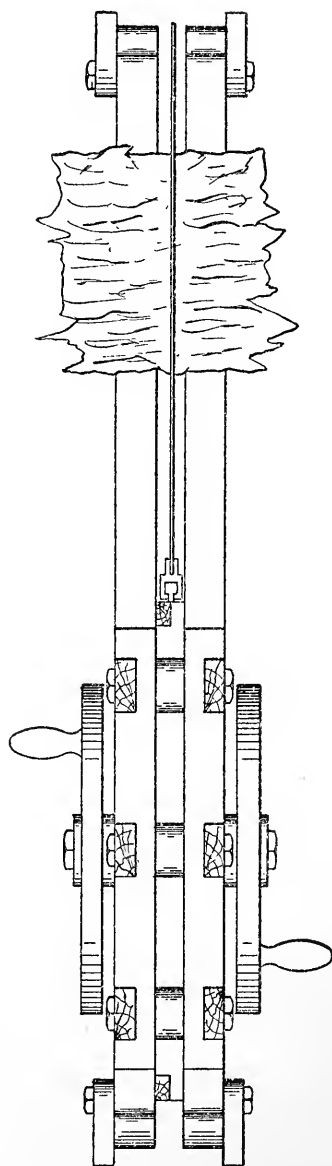
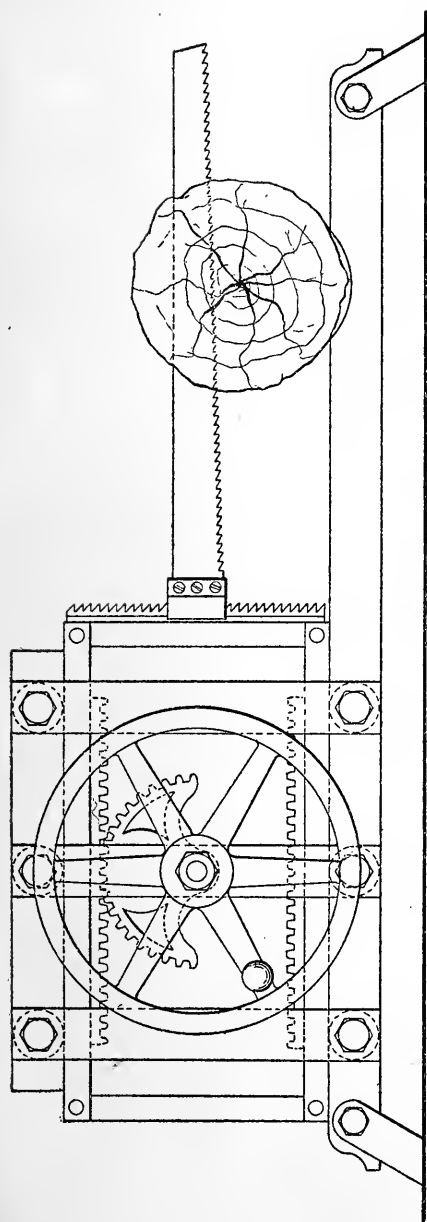
Fortuitous Conceptions.

"Well, what have you accomplished?" I asked my nephew when my pupils took their seats for the third session. I noticed the young lady's eyes beaming with triumph and her brother's as jubilant and anxious as the previous evening, while my nephew's face bore a very serious look, so I took him up first.

"I have devised the framework for the cross-cut log-sawing machine. Here is a sketch showing a side elevation and a top view.

"The machine [see opposite] is composed of three rectangular frames. The two wider frames are coupled and held rigidly the proper distance apart by means of six double ended bolts, each having an enlargement between its threaded ends, carrying a cast iron roller. The narrower frame has, internally secured thereto, the oppositely disposed toothed racks, and slides telescopically between said two wider frames, riding upon said rollers and thus sliding reciprocally with the least amount of friction. The toothed cam and the fly wheels are secured upon a shaft suitably journaled in the middle uprights of the outer frames, as shown.

"To make sure that the cost of the machine will not exceed five dollars, I called upon a lumber man and asked him to furnish me an estimate on the cost of the lumber it would take to make the three frames, and on a foundry



man who furnished me the probable cost of the castings in quantities of one thousand sets. The total cost of the lumber and castings in quantities is estimated about \$2.50, and the cross cut saws in quantities will cost about \$1.50 each. There remains \$1 to pay for the time of machining the castings and assembling the machine, which, I was told by a machinist, is somewhat more than enough.

"On my way home yesterday I stopped to examine a wagon jack as a blacksmith raised a heavy truck with it. The ratchet-toothed rack bar and pawl action gave me an idea of a new feeding mechanism for our log-sawing machine which I think is better and cheaper than the screw. So, to reduce, in fact eliminate entirely, the cost of machining, I have substituted a cast iron rack for the wrought iron feed screw and ratchet. In fact, as I criticised the function of the screw saw-feed mechanism, we selected yesterday, and examined its action in drill presses I became convinced that as the screw must move the saw vertically a distance of thirty-six inches and bear the entire strain of the cutting, a screw is wholly inadequate for the purpose. Furthermore, one would have some turning to do to raise the saw by turning the screw unless the nut is made split, which in the present instance will hardly do. With the rack-bar-and-pawl arrangement the saw can be raised and adjusted to the log in an instant. The rack bar being a stout casting and laying flat against the wooden frame cannot deflect, or yield, under the stress of the cutting, as the screw might, and would cost about one-fourth of what the screw and ratchet would."

"Well done, William," I commented, patting him on the back. "Always criticise every element of the mechanism of your invention and weigh every phase of its adequacy in point of strength, speed, convenience of

manipulation, and cost of manufacture. When cost of manufacture is an item of some importance, don't neglect to call upon dealers or manufacturers for estimates and ascertain the probable cost as nearly as possible. Successful inventing is as much a matter of judicious management as successful engineering or architecture.

"What is your scheme, Miss Sharp?"

Laughing embarrassed and blushing and squinting apprehensively, she said diffidently: "I am Joseph's sister. I was working on an invention of my own instead of on the problem." The young men pricked up their ears.

Joseph became impatient, jumped to his feet and jabbered excitedly: "What's your invention, sis? Let's see it."

"Not a flying machine, Joseph. I won't interfere with your invention."

"I guess you won't, sis. It takes a mechanic to invent a flying machine. I am proud of my invention. It is a perfect flying machine. An aeromobile. That's what I call it. It beats everything on the market all hollow. I have been working on the drawings last night until 2 o'clock this morning and—"

"Please explain in detail how you came about to make your invention and what it is," I asked her encouragingly, shutting off Joseph's rambling expatiation on his flying machine with a gesture.

The young lady's bosom heaved with pride and joy at my nephew's admiration of her inventive precocity as she began to relate her own story in a slow and deliberate cadence. "Last night, after recapitulating the lesson of the evening, I felt indisposed to take up the solution of the log-sawing machine problem. Deferring the problem until morning, I lit my gasolene stove to warm water to wash the dishes and took up the book I am reading. The water began to boil and I turned down the gasolene

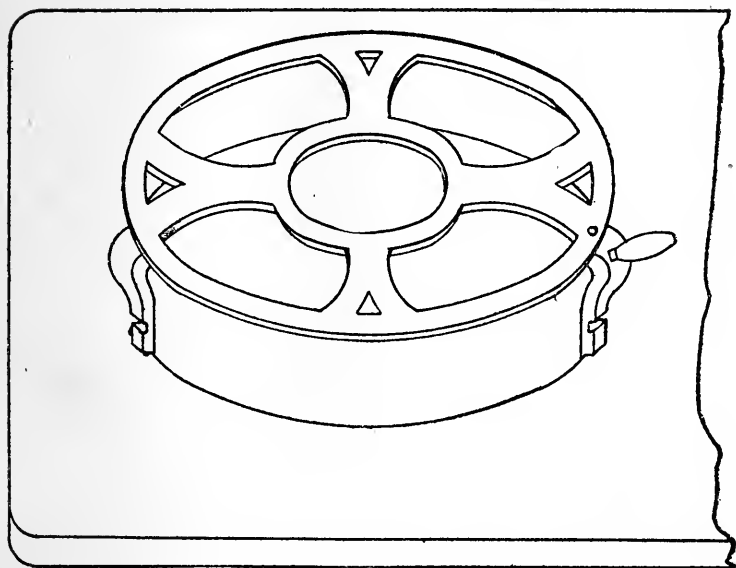
flow, continuing to read the book to finish the interesting episode. The hissing sound of the boiling water annoyed me greatly and I resorted to my customary methods of keeping the water hot without hissing in such exigencies. This I accomplished by setting the kettle on two flat irons in order to raise its bottom above the flame. I have to do this every morning to keep the oatmeal hot without burning while I am washing and dressing—”

“Pardon me for interrupting you. Why don’t you turn down the gasolene flow still lower instead of raising the kettle or the oatmeal pan on two flat irons?”

“The gasolene flow, unlike the gas jet or lamp burner, does not stand turning down below a certain height. When turned down too low, a slight puff of air in the room puts it out, and so soon as the burner cools off it goes out without fanning and fills the room with the noxious, dangerous fumes. When neglected to turn off at once a dangerous stream of combustible fluid runs on the floor. This is perhaps responsible for most of the gasolene conflagrations so often reported in the newspapers.

“A few minutes later the kettle I had set on the sad irons slipped and the contents diffused itself over a large area of the floor. I was about to swear off using a gasolene stove in the future, as this is not the first time my scheme played me such a trick, when I remembered that I was learning the art of inventing, the aim and object of which is to banish such nuisances by contriving better means. After I mopped up the floor and straightened things out I set to work to devise means for raising and lowering the cooking utensils. And this is my scheme.”

“One moment, please. I wish to ask you a few questions before I look at your sketch. Do all the gas and gasolene stove users have to resort to some such means to keep the oatmeal from burning to the bottom, or is it



because yours is an old style stove? To what other means do users resort? If this is a nuisance common to all vapor stoves its banishment is an important invention. How do you know that there is not something of the kind on the market?"

"My gasolene stove is comparatively new. Mother bought it only two months ago. It represents the latest model in gasolene stoves. My mother puts the oatmeal pan in boiling water to keep it hot without burning to the bottom, but this method is objectionable for two reasons: First, because the stove must then burn full blaze to keep the water constantly boiling, which is a considerable waste of the precious fluid; and second, the water keeps on emitting a musical sound I greatly dislike.

"I visited this noon, on my way to lunch, two of the largest gas and gasolene stove dealers in this city and asked them to consult the catalogues and descriptive circulars of gas and gasolene stoves and ascertain whether

means to keep the bottom of the utensil adjustably above the blaze has already been adopted by vapor stove makers. They searched their literature and assured me that nothing of the kind is shown or described in any of the catalogues or circulars."

"It is inadvisable to disclose your conception to an interested party until the application for the patent has been filed in the Patent Office. Even then one should deliberate upon the advisability of the course before exposing the conception. You should have asked the dealers to permit you to inspect their catalogues and circulars without telling them for what purpose."

"If so, how does an inventor disclose his invention to his patent attorney—particularly to those patent attorney companies that employ scores of men, women, boys, and girls—and to the Patent Office employees?"

"A registered patent attorney is a duly recognized practitioner before the United State Patent Office. A breach of trust on his part is a criminal offence and would quickly end his career as a patent attorney. No patent attorney or Patent Office employee can avail himself of the inventor's disclosure with impunity. Any other person to whom an invention is disclosed may file an application for a patent on the same invention with perfect impunity."

"I did not tell them my scheme, though. I only told them that I had invented means for raising and lowering the utensil in relation to the flame."

"You have certainly told them enough, Miss Sharp. In fact you have told them all that some smart clerk or bystander would want to know in order to invent something like it. This is another trait that distinguishes the practical from the improvident inventor. The former learned to keep his ideas to himself, and the latter talks freely about his achievements, and before his case passes the

Patent Office he bumps up against an interfering application and pays dearly for his thoughtlessness or, the loquacious one, for the little pleasure of vainglorious boasting. Inventions of nominal value do not, of course, require such caution. But valuable improvements should not be disclosed. Many interference cases might have been avoided if the inventors had kept their own counsel. This is a hint worth remembering. Now please explain your invention, Miss Sharp."

"My invention is simply a tripod, one leg of which is movable and all the three legs have exteriorly a series of corresponding notches. A turn of the movable leg admits the three legs into the opening in the top plate of the stove. When the movable leg is returned to its normal position the notches in the three legs engage the top plate and thus support the culinary utensil the desired height from the flame."

Both young men glanced at the sketch over Miss Sharp's shoulder, and William, in a burst of boyish glee, thoughtlessly rattled off ecstatically: "Oh, I can improve upon this invention, all right." The young lady leered at him superciliously, as if such a thing were entirely out of the question. A moment later, however, she became apprehensive, and reflecting upon the awful humiliation (?) she blushed and flushed and frowned and fretted from resentment. Finally she muttered indignantly:

"I haven't asked you to improve on my invention, Mr. Swift, have I?" Swift, perceiving the young lady had taken umbrage at his remark, humbly apologized for his impudence.

Very much surprised that she had so soon forgotten my inculcations, I remarked: "This is another feature which distinguishes the practical from the improvident inventor. The former seeks to have his inventions criticised as much as possible and gratefully avails himself

of every feasible suggestion, while the latter resents criticism. In consequence whereof the practical inventor's inventions are always elaborated and practical, while the other's are often crude and impracticable to the point of uselessness.

"I have already remarked that when you have conceived the novel function, principle, or result, and devised means for performing the same, however crude and impracticable the means may be, you own the invention and are legally and morally entitled to any assistance you may require to elaborate your ideas.

The fact that another person found some flaws in your invention does not prove that he is the smarter nor does it legally or morally detract from your credit as the first, sole, and original inventor of the invention in question. I would suggest, Miss Sharp, that you ask Mr. Swift to point out the improvement he could make."

The girl hesitated. "Oh, he is only vaunting," she said looking at him obliquely and smiling acridly. "I tried enough to simplify or improve it. It is as simple and practical as it can be made."

I laughed at her conceitedness and vanity. "I am aware that nothing offends the young inventor more keenly than the pointing out of a flaw in his or her invention, Miss Sharp," I said. "But you are learning to become a practical inventor, and a practical inventor, as I said before, unlike the improvident inventor, makes use of every practical hint and endeavors to make his or her invention as elaborate as it can be made."

"But my invention is as good as it can be made and certainly simple enough," protested the young lady. "There are only three legs, one of which is rotatable. Two legs will not work, and more than one rotatable leg is not desirable. What improvement could be made on such a simple thing? I am sorry I have shown you the sketch

in their presence," she concluded, smiling gingerly; but she really meant what she said.

"Do you suspect the young men of intending to claim priority to your invention, Miss Sharp?"

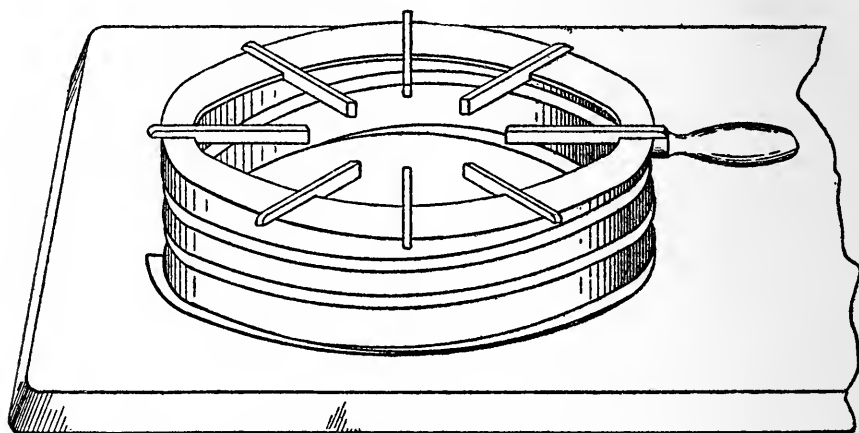
"No, I don't. But I wish they had not seen it," she blurted out.

"I know how you feel about Swift's remark, Miss Sharp. Nevertheless, I want you for your own good to ask him to explain the improvement he has conceived, if only to show that it is possible to improve even on such a simple thing. As he is too anxious to volunteer assistance, I will ask him to explain the improvement, if you don't feel inclined to impose upon his good nature. William, please explain the improvement you perceived it is possible to make on this invention."

William understood that volunteering suggestions was not the proper thing to do for a practical inventor, particularly when such valuable services are not only not appreciated by the inventors, but often bitterly resented. He therefore repented himself of what he had said and flatly refused to disclose his conception. As I pressed him hard to give it out, he declared that it was only an idea of an insignificant change that had flashed across his mind as he glanced at the sketch. This pleased the young lady immensely. "I told you that my invention is so simple that it cannot be improved upon," she burst out jubilantly. "What is the little change you said you could make on my invention, Mr. Swift?" she now asked out of aroused womanly curiosity, smiling at her admirer exultantly.

William declined to tell, again remarking that it is a mere change not worth mentioning that suggested itself to him at sight of the sketch. His remark, however, did not satisfy me, and I urged him to disclose his conception

fully, freely, and truthfully. After some discussion and persuasion he sketched out his conception, and explained it:



“Instead of a tripod I should use a piece of sheet iron stove pipe, a sheet iron thimble of a height corresponding to the distance between the top plate of the gasoline stove and the flowcock stem, and of a diameter slightly larger than the diameter of the orifice in the top plate of the stove. Upon the periphery of this cylinder I should have impressed screw threads, like those in a Mason fruit jar cap, and provide the cylinder with a small wooden knob as shown. In the orifice of the top plate of the stove—in stoves already in use—I should make a shear cut half an inch deep, and with a pair of pliers bend the internal periphery downward so as to form a spiral, or an internal screw thread of one evolution, into which the threaded stovepipe cylinder would screw. The orifice of the cylinder, being practically of the same diameter as the orifice in the top plate of the stove, would receive the old spider or utensil rest. The entire cost of the arrangement would thus be that of a piece of stove pipe, the formation of the screw threads thereon, and the little

knob. The cylinder would never have to be removed, and the arrangement would be instantly and minutely adjustable to any desirable height by turning the cylinder in either direction without even interfering with the utensil thereon."

The drop in the thermometer of the young lady's humor was flagrantly perceptible. She, like every young inventor, felt keenly humiliated by the striking improvement on her invention. After looking at William's sketch a few moments, she smirked saucily, and simpered blandly: "You may as well have it all, Mr. Swift," blushing to the very root of her golden tresses. "I suppose the invention belongs to him?" she inquired hoarsely.

"Not at all, madam," I assured her, laughing at her suppressed petulancy. "Viewed generically, there is substantial identity in the construction of these two devices. If the idea of holding the utensil adjustably over the flame of a vapor burner is broadly new, you are legally entitled to the improvement made by him at your request and you would be the sole inventor thereof, even though the means employed to carry out the function is radically different in construction. But if the broad idea of means for adjusting the utensil in relation to the burner of a vapor stove is anticipated by a prior patent, and the present improvement in the means is made upon your request, it being a broad departure from your scheme, in fact in part a new principle, Swift would have to apply for the patent and assign his patent to you. But supposing you had not disclosed your scheme to Mr. Swift and had not asked him to criticise and improve it for you, but filed an application and secured a patent thereon. When your patent is published, Mr. Swift, perceiving the costliness of your support, would make the improvement, secure a patent thereon, and put the thing on the market.

His support being so much better and cheaper to manufacture than yours would be a success and yours a flat failure.”*

The young lady, though now pacified, clandestinely bemoaned her fate that she must share her glory with her admirer. William noticed it and regretted his being the cause of her apparent distress. Presently a thrill of joy passed over his body. His face became luminous, his eyes sparkled, and his body charged with ecstasy. I knew he had something to say and turned my gaze on him, and so did Miss Sharp and her brother. William indulged in profound meditation for a few minutes and then very reluctantly and protractedly said: “Miss Sharp, I helped you out on your invention, I wish you would assist me to work out mine.”

The girl became alert. “What is your invention, Mr. Swift?” but soon fell back into discomfiture for fear that his invention might be better than hers or that she might not be able to improve upon it as he did upon hers. Joseph was more persistent in his inquiries and eager to know William’s invention. “What is your invention, Will?” he asked repeatedly.

“Oh, you see he is hesitating to show us his invention,” remarked Miss Sharp.

*In practice, Miss Sharp’s tripod would, most likely, be more of a financial success than Swift’s tubular support, even though the latter’s support would be cheaper to manufacture. Cost of manufacturing the invention claims the inventor’s most earnest attention. But the cost of marketing things is in almost every instance greater than the cost of manufacturing them. The tripod support could be sold through the regular channels of trade, while the tubular support would require house-to-house canvassers to sell it direct to householders (see page 176), and then some of the prospective purchasers might object to the shearcut and bending of the top plate of the stove.

"Yes, I do hesitate," returned my nephew emphatically. "I hesitate to disclose my conception for two reasons: First, because I have just conceived it and have not given it sufficient thought; and, second, because I know Joseph's garrulous disposition. Tomorrow every man in the Navy Yard will know every detail of my invention."

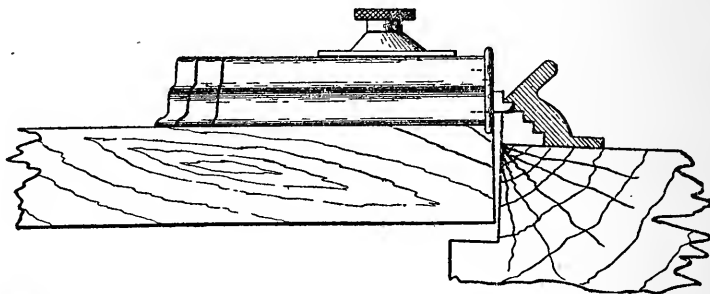
Joseph blushed. "Oh, you are scared somebody will steal your great invention, Will. I am not afraid of mine. I tell everybody and show my drawings."

"You are right, William. Never disclose your conception to a loquacious friend, nor to any person before you have given it sufficient thought and elaborated it yourself as much as possible. However, if Joseph will promise not to talk about it carelessly, I should ask you to explain your conception right now."

Joseph promised and William began:

"The door of my room is provided with a latch lock. When I leave the room I just slam the door. It quite frequently happens that when I return home late in the night I find the door unlocked. The cause of it soon became apparent to me. Either the slam was not forcible enough to drive the latch into the keeper or the door warped slightly; but more often a match stem lodged itself between the door and the door jam that prevented the latch from engaging the keeper. This evil doubtless exists wherever latch locks are used. The annoyance is great, since the door remains unlocked during the absence of the occupant. Yet no one seemed to think it of sufficient importance to remedy it. Neither did I until a few moments ago, though the incident repeated itself last night. It occurred to me that the defect could easily be cured by a slight change in the construction of the keeper, by providing the latter with an extra step."

William drew his idea of accomplishing his object. No sooner had he completed his sketch than Miss Sharp clapped her hands rapturously and exclaimed: "Oh, that's a cinch. I can improve on this idea alright," and began to sketch out her improvement.



"Explain the merits of your improvement over his, Miss Sharp, please," I asked her.

"Why, with only that much of the latch in engagement," pointing to Swift's sketch and clattering ludicrously, "any person can enter a dull and greased knife edge and slide the yielding latch back and open the door. In my construction the surface of the latch toward the outside is parallel with the door, and thus even if one step of the keeper is engaged the latch cannot be worked by a knife edge or other instrument, while when two steps are engaged a larger part of the latch in the keeper is the result."

"This is a substantial structural improvement, Miss Sharp," I commented, "but it does not involve a deviation from William's principle. It merely elaborates his construction."

"This self-conceit is a most dangerous shelf,
Where many have made a shipwreck unawares;
He who doth trust too much unto himself,
Can never fail to fall in many snares."
—*Earl of Sterling.*

LESSON X.

Court Criticism and Invite Suggestion.

"I would be willing to bet most anything that nobody could improve on my inventions," exclaimed Joseph Sharp, challenging the other two tyros and myself. Inventors of Joseph's mental caliber are always sure of their ground. And many are the snares, traps and pitfalls into which such inventors, as the Earl said, 'never fail to fall.' There are free-search, contingency-fee, lists of inventions wanted, booklets suggesting what to invent, and certain other temptingly baited snares especially spread out for such self-conceited asses as Joseph Sharp was at that time. Joseph challenged my nephew to take up his bet or to enter with him into a controversy on the subject. But the latter paid no attention to him. William was deeply pre-occupied with the assimilation of the facts the incidents of the previous lesson presented to his mind, and after several moments of silent contemplation he observed:

"There is now no doubt in my mind that there is more than one way of making almost every invention. It being so, I am at a loss to conceive how an inventor could make sure that after he had done the best he could in the way of elaborating his invention and gone to the expense of procuring a patent and building a working model he will not

be superseded by another inventor. Miss Sharp's adjustable culinary utensil support offers a very cogent case in point."

"Quite right, Mr. Swift," assented the young lady, sadly disappointed that her hope of winning fortune by inventing was suddenly melting into nothingness. The discovery that there is more than one way of embodying the principles of her invention seemed to unnerve her. "It just occurred to me," she whispered into her admirer's ear, "that the reason why so many thousands of inventors fail to realize on their inventing is simply because no sooner had one procured a patent on a certain invention than thousands of others get out patents on the same invention—"

"Not thousands of others, Miss Sharp," interrupted my nephew, smiling at her apparent gross exaggeration.

"Yes, indeed; thousands of them, Mr. Swift," she returned seriously. "I have not been here long enough to know much about patents. But your uncle sent me up into the Attorneys' Room in the Patent Office the other day, and while I was making notes of the file of an application involved in an interference I overheard a man, evidently a disappointed inventor, talking to his attorney, who was examining the file of his pending application, something to this effect: 'I got my ideas of inventing my non-refillable bottle and my car coupler from a list of inventions wanted I had received from the prominent patent attorney firm, Messrs. D— & Co., together with a lot of client-soliciting literature, which seemed very logical at the time, but looks devious to me now. I thought that if Messrs. D— & Co. send out such a list of inventions wanted, such inventions must be badly wanted. But after I got my patents I discovered that nearly *four thousand patents on non-refillable bottles* have already been

issued. As for patents on car couplers, the Patent Office is just overrun with them."

My nephew gasped for breath, and gazed at the girl dubiously. "FOUR THOUSAND PATENTS on such a simple thing as a bottle stopper! It is impossible, Miss Sharp," he rejoined contradictorily. Swift lost his interest in the subject under consideration and gazed at the girl fixedly, believing he had discovered some peculiarity in her mental constituency of which he was wholly unaware, but made this emphatic statement to bring her to her senses. The girl guessed that he was seriously questioning her statement and appealed to me mutely.

"Yes, there are thousands of patents on non-refillable bottles, car couplers, and on almost every one of the subjects enumerated in the lists of inventions wanted and in the booklets containing suggestions of what to invent disseminated by Messrs. D—— & Co. and patent attorneys of their ilk. But this fact should mean nothing to you, for I mean to guard you against falling into any of those insidious traps and snares. If there were no way of making sure that after an inventor had done the best he could, and all he should, he will not be superseded by others, the entire patent system would indeed be a sad failure and a public nuisance. But there is a very effective way of precluding all others from making, using or selling any modification of the patented invention. So be at ease and learn all about that way and never depart from the right course."

"What is that way?" both the young lady and her admirer eagerly inquired in one breath, very much encouraged by my assurance.

"It is in the way the patent is made.

"Countless modifications can be made and patented on virtually every invention. The flying machine invention,

for example, is not quite three years old, and there are already quite a number of modifications thereof in use. But every one of the flying-machine inventors must pay the Wright brothers a license fee for permission to build and use his modification. The law does not require the inventor to disclose all the modifications possible, but to disclose the *best mode* in which he contemplates embodying the principles of his invention. Commerce requires no more. The purchaser of a patent right does not care how many modifications it is possible to make on the invention offered him. What he demands is a model or drawing showing the best mode in which the principles of the invention should be embodied and marketed, and a patent that will preclude all others from using the same principles, in whatever form they may be embodied, without paying him a license fee for permission to use them.

“With a commercially desirable, legally recognized invention, the inventor’s financial success depends entirely upon the quality of his patent. If the tripod utensil support were covered by a patent of proper stamina, the inventor of the tubular utensil support, or of any other form of utensil support for holding the utensil adjustably in relation to the burner of a vapor-stove burner, could not use his invention, however superior it might be, without paying Miss Sharp a stipulated license fee for a license to make and market his invention.

“The patent is the most important element essential to financial success by inventing. We will discuss the patent in all its phases later. At the present we are considering the proper preparation of the invention for the patent. Before applying for the patent the invention should be elaborated to the highest degree of perfection possible. Mechanical perfection, in complicated or intricate mechanical structures, cannot be attained in one breath, nor can it be expected to emanate from one mind.

In original complicated inventions co-operation is almost unavoidable.

“The Wise Prophet said: ‘Two are better than one, because they have a good reward for their labor. If they fall, one will lift up his fellow.’ To obtain a good reward for your labor in inventing, your inventions must be first commercially desirable, next mechanically practicable, and then free from error, well developed and studiously elaborated to the highest degree possible. To attain such perfection two minds are always better than one. When one falls into error, complexity, or impracticability, his coadjutor will lift him up and the result will be, error, and consequent disappointment, avoided. The advantages of co-operation are too obvious to require comment. The second person usually begins where the first one left off, and the result is a longer stretch. I should therefore advise every person who wishes to become a practical inventor and make none but commercially desirable, carefully elaborated inventions to join, if possible, in this labor some like minded person of similar aptitude, honesty, and ambition and assiduously work together for their mutual emolument and advantage. When two work on an invention they are termed “joint inventors” and the patent must be applied for by both parties and will be issued to both parties.

“A suitable partner, or joint inventor, is, however, not so easy to procure. A progressive inventor endowed with a lively imagination will find it extremely difficult, if not at all impossible, to find a person of similar aptitudes and ambitions. But by a little judicious maneuvering one can easily obtain some criticism and suggestions which may greatly contribute to the elaboration of the invention. The successes of Thomas A. Edison, the most renowned inventor of this age, are said to be largely due to suggestions from his employees. Some of the largest and most

prosperous manufacturing and mercantile establishments in this country have "suggestion boxes" in their offices. Every one of their thousands of employees is requested to make some suggestion as to the best method of doing things in the particular department he is employed. In other words, the factory superintendents and the business managers invite their office boys, porters, and workmen to teach them their business. And superintendents and business managers very readily avail themselves of every suggestion that appeals to them as feasible whether it comes from some head man or from a chimney sweep.

"I repeat, court criticism and invite suggestions of changes and alterations in the mechanisms of your inventions and freely avail yourselves of such as seem feasible. But bear in mind that the inchoate right in a nascent invention is a very frail creature of patent law [it has no existence in common law] and must be guarded jealously. Do not disclose your inventions to any interested person before the application for the patent has been filed. There are some men in this world who are always ready to say: 'I thought of it before.' Beware of such persons and never mention the date of the conception of your invention to any person.

"It often happens that one conceives a very valuable new and useful function and the means for performing the same, but the latter is not quite satisfactory to him and may require considerable time to work it out or to recast it entirely. Heretofore an inventor with such an invention had recourse to a Caveat. The Caveat was a drawing and description of the invention, together with a petition and oath, deposited with the Commissioner of Patents. The Caveat was intended to afford the inventor all the time he may need to work out his invention in the most practical manner. The Caveat was kept in the secret

archives of the Patent Office, and when an application for a similar invention was filed the caveator was notified of the fact and given three months time in which to file his complete application and subsequently prove priority. But the Caveat, to be effective, had to be drawn quite skillfully, which was seldom the case, and was generally not clearly understood by inventors. And so Congress, by an act of July 1, 1910, repealed the laws relating to Caveats. Thus the laws that before afforded Caveat protection are now obsolete.

“In the absence of Caveat or any other form of official provisional protection, the best course to pursue is to make a sketch of the machine or the mechanisms for performing the new function, however crude or impracticable the organization may be, attach thereto a description of the construction and operation of the machine written in your own way—that is, just as you would write the letter to a prospective purchaser of your invention, explaining the construction, operation and advantages of the machine; enclose the sketch and description in an envelop, address the letter to yourself, and mail it registered. When you get the registered letter do not open it or in any way alter any part thereof, but attach to it the receipt of the postmaster and the return card and put the whole away securely. If at any time you are called upon to prove the date of conception of the invention and when the first drawing thereof was made, the sealed registered letter with the receipt and return card will be accepted as proof positive that you were in possession of the invention on the date the letter was mailed. The registered letter alone is sufficient, but the stamp on the letter may in course of time become obliterated. I therefore advise you to retain the receipt and the return card.”

My nephew became dissatisfied with his invention, and with an air of impatience exclaimed: "Haphazard inventing is not likely to eventuate in an invention of appreciable commercial value. We will no doubt have to confine our energies to a particular class, as you suggested. So please let us plunge into the subject at once."

"Haphazard inventing is more likely to eventuate in some invention of appreciable commercial value than class inventing. All one has to do to make a fortune by inventing is to invent something of use to the masses. It matters not what that article is nor in what class it is, so long as it is new and capable of being brought into extensive use. The invention of a popular collar button, a garter, a toy, a household article of large sales means an immense fortune to the inventor. And the invention of an absolutely original thing for which there is extensive use, if protected by a patent of proper stamina, is a monopoly of inestimable value."

Joseph Sharp suddenly jumped to his feet and announced, with emphatic claim to priority, that he had just conceived a new and useful invention of the kind that must yield immense fortune, but not fame as his flying machine will bring him. His invention, he said, was a household article of which a dozen or more is found in every household, and that he can make dozens of such inventions every day. The last part of his announcement brought an involuntary snicker from his audience and cast a shadow of discredit upon his new invention. His sister's curiosity had no bounds, but Joseph was somewhat apprehensive and hesitated to disclose his conception. Finally, after considerable importunity, he began:

"Every claim in a patent begins with the words *The combination*, don't it? So a combination is of course patentable, ain't it?" I nodded in the affirmative and he continued: "Well, then, I conceived the idea of com-

binning a tablespoon with a fork; that is to say, to form the tines of the fork in the end of the spoon handle, so that one does not have to have a lot of pieces around his plate at the table, and when buying silverware don't have to pay for both spoons and forks." My nephew snickered at the impracticability of his chum's ideas of useful invention, and Miss Sharp blushed slightly and smiled at her minion brother's earnestness.

"The word *combination*, used in the claims to patentable subject matter, means the combination of elements of which every self-contained or compound device or thing, however simple it may be, is necessarily composed. As an example, a needle is a combination of an eye, a body, and a point. The combination of two things each of which performs its former function independently of the other is not patentable, Joseph, for the reason that there is no new and useful function as a result of such combination."

Joseph was sad—very sad. Like every young and improvident inventor, he felt a fortune was escaping him and struggled in his mind for some means of grasping hold of it. "Isn't there some way of getting some kind of a patent on my combination?" he inquired deprecatingly.

"Why, yes. There is 'some way' of getting 'some kind' of a patent, Joseph. Every young inventor whose invention is reported not patentable clamors for 'some way' to get 'some kind' of a patent on his invention, and the patent attorney appealed to suggests a design patent."

"Can I get a design patent on my combination?"

"Yes, you can, if it is not already patented [which it is]. But do you know what a design patent is and what sort of protection it affords? Of course you don't. Neither do the majority of the thousands of inventors that obtain design patents until they try to dispose of their property rights."

"To behold is not necessarily to observe, and the power of comparing and combining is only to be obtained by education."—*Humboldt*.

LESSON XI.

Gears—Their Names and Uses.

"My dear uncle is obviously not in favor of our beginning to invent before we have learned all an inventor ought to know," said my nephew to Miss Sharp.

"We should spend a few weeks at least on seeing things in motion before we begin to invent," answered the young lady.

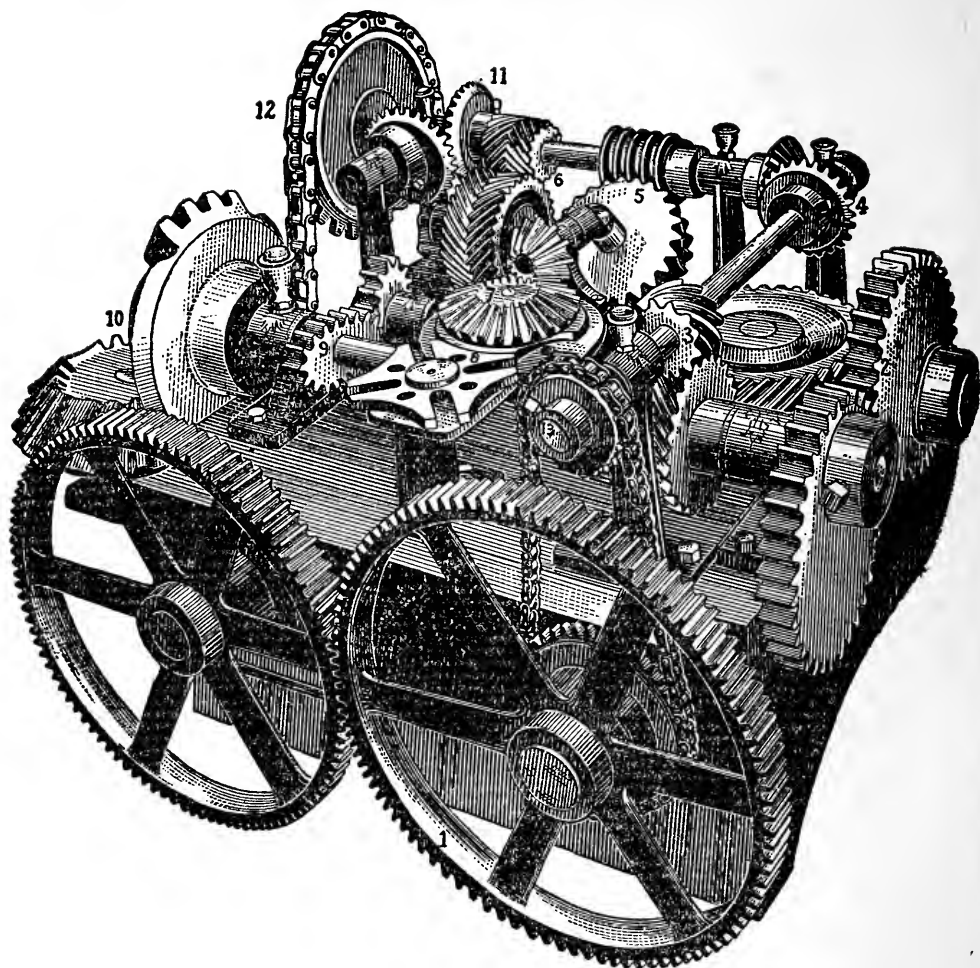
"No one sees more things in motion than I do in the Navy Yard," said Joseph. "Yet my seeing does me little good. I can think of nothing to invent except my flying machine and the combinations which uncle says are not patentable."

"The applicant for a position in the Pinkerton Detective Agency," I told the tyros, "is subjected to the following test: One of the detectives disguises himself as a plumber or a locksmith and with an armful of tools of his assumed trade passes quickly between the chief of the detective bureau and the applicant. The latter is then asked to tell what he had seen about the man that just passed. If the applicant is fit for the work of a detective he will say, without further interrogation—if this be the detailed description of the man—'the man that passed by just now is about 35 years old, 5 feet 10 inches tall, weighs about 160 pounds, has regular features, blue eyes, fair hair and a bronze mustache; he wore a blue

shirt, brown overalls, and hob-nailed shoes, and carried a wrench, a hammer, a string of pipe couplings,' etc., or whatever the detail description of the man was. Now, you know that a thousand other people seeing the same man pass by could tell nothing more than that they have seen a man carrying a plumber's wrench and something else pass by. Seeing is not observing, Joseph. Visit a court of justice and observe the confusion of the witnesses' minds in trying to tell what they had seen and you will have a due appreciation of the difference between *seeing* and *observing*.

"The practical inventor, like the detective, must observe things, not merely see them. Everything you observe must become emblazoned on your mind. After you have seen the shapes and forms of a large number of things you will be able to see all the details of an intricate piece of mechanism almost at a glance.

"Gears enter into the construction of practically every piece of mechanism, and there are shapes and cuts of gears for all practical purposes. A thorough knowledge of all the gears in use is imperatively essential. Familiarize yourselves with all the shapes and forms and uses of gears. It will, however, take some years before you will have a chance to see in actual operation all the shapes and forms and uses of all gears in practical use. Here is a clever combination of all the various shapes and forms of gears in use and the names by which they are designated:



Furnished by the Boston Gear Works.

- 1 is an elliptic spur gear with large minor axis ;
- 2, an elliptic spur gear with small minor axis ;
- 3, three small spiral gears with shafts in different planes
- 4, a miter gear ;
- 5, a worm gear and worm ;
- 6, a herringbone gear or special spur gear ;
- 7, a bevel gear with planed teeth ;
- 8, an intermittent gear with four stops ;
- 9, an oval gear ;
- 10, an intermittent miter gear with four stops ;
- 11, an elliptic miter gear ;
- 12, a sprocket wheel and special steel chain.

"On page 108 is a similar combination of the various shapes and forms of brass gears available for the inventor's use in small models, and in the manufacture of small new mechanisms and a detail description thereof:

"The cut is intended to show a group of gearing not usually seen combined in any one machine.

"The mechanism is driven by a worm and gear underneath through which power is transmitted to the miter gear in the center of the machine. Motion is communicated both right and left by means of two other miter gears. Gear 5 and mate are a form of oval gears. The holes being in the center, the curves on the periphery are formed in a much different way than for regular ellipsics.

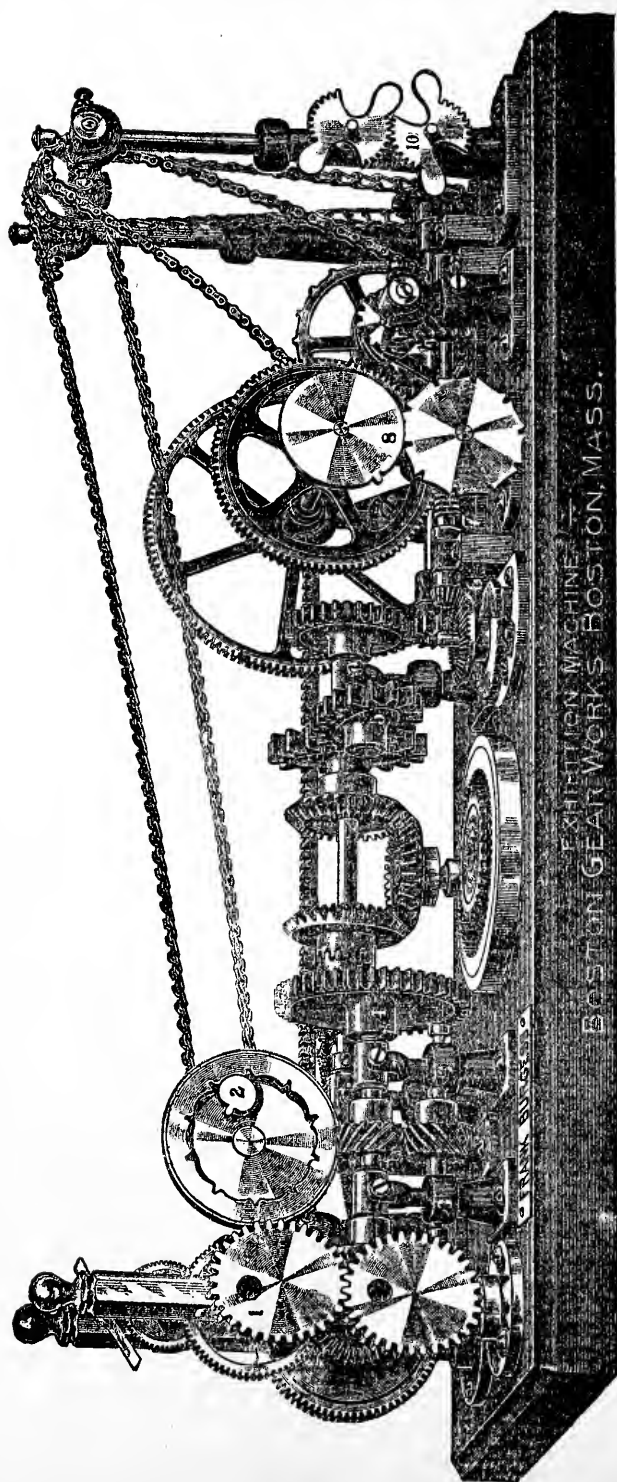
"This style will give an acceleration and retardation alternately on each half revolution.

"The elliptic gears marked 1, shown on the left side are made with the periphery of true elliptical form, and the pitch line of each is a perfect ellipse, and the centers of holes or shafts are in exact foci. In this form the alternate retardation and acceleration will occur on each revolution in place of each half, as in the case of the oval form described above.

"Back of these ellipsics may be seen a train of spur gears with fan regulator.

"A little to the right will be seen an internal intermittent gear and pinion 2.

"Underneath these gears is a right and left hand spiral with parallel shafts. This style is usually called helical spur gears. When made double to avoid end thrusts of shafts they are called double helical spur gears or 'herringbone' gears. This style, if made properly, will usually transmit motion smoother than ordinary spur gears, and is sometimes used where very high speed is desired.



Furnished by the Boston Gear Works.

"Gear 6 illustrates a pair of skew bevel gears or bevel gears with the axes not in the same plane which, when quite a little distance from each other, should be replaced by spiral gears similar to those marked 9.

"Gears 10, at the extreme right of the machine, are a special form of gears of two different pitches, viz: 24 and 3 diametrical pitch. When one of the large teeth is in mesh with the corresponding space of the mate gear the speed of the driven axis is greatly and suddenly increased until the fine teeth are in mesh again.

"The acceleration of the driven axis will occur at every half revolution, and is much more sudden than would be obtained by the use of elliptical gears in which there is a gradual increase and decrease of speed of the driven axis.

"Gears No. 8 are an ordinary set of intermittents.

"Back of these is a worm gear having many teeth, which is in mesh with a worm of corresponding pitch. This form is to illustrate an enormous reduction of speed.

"The worm is single thread, and the gear having 150 teeth it requires 150 revolutions of the worm to make one revolution of the shaft, making a speed reduction of 150 to 1. If the worm were made with double thread the speed reduction would be only 75 to 1. If the worm were triple thread the speed reduction would be 50 to 1.

"When the worm is made with more than four threads it is usually called a spiral gear. Spiral gears, sometimes called helical gears, are simply a special form of worm and worm gearing in which the worm or driver has a large number of threads or teeth.

"To use the spiral gears instead of ordinary worm gears is generally to make the speed reduction as small as possible.

"With a single threaded worm and gear it is not practical to have the ratio much less than 20 to 1, whereas

in spiral gears we can run them so as to be equal, or 1 to 1.

"The cut also shows several forms of sprocket wheels and chain.

"The transmission of power by the use of chain in place of leather belting has for years interested many of the best mechanics, and it has been demonstrated that the use of a properly made chain will give very satisfactory results.

"The transmission of power in this way is more positive than by the use of belting, and the diameter of sprocket wheels can be very much smaller than the diameter of pulleys in transmitting the same power."

"Where we cannot invent we may at least improve; we may give somewhat of novelty to that which was old, condensation to that which was diffuse, perspicuity to that which was obscure, and currency to that which was recondite."—*Colton.*

LESSON XII.

Improvements upon Improvements.

At the conclusion of the foregoing lesson Joseph Sharp, whose patience had reached the limit of endurance, demanded to know my opinion of his flying machine invention. One can read an inventor's temperament from the mechanical organization of his invention with almost unerring certainty. An examination of his sketch disclosed the fact that Joseph Sharp was indeed a great genius, but thoughtless and impatient. The sketch showed unmistakably that its author was endowed with a marvelous inventive faculty, but being guided neither by rule nor by experience it simply ran riot and plotted a maze of impossible mechanisms. The entire machine was a complex labyrinth of levers, gears, springs, belts, chains, quadrants, sectors, wings, and propellers—anything and everything he could think of he stuck into it without regard to practicability. The mechanism alone would have required at least a twenty-five horse power engine to set it in motion, let alone lifting it with the framework from the ground and holding it suspended in the air. Still, it was theoretically an operative mechanism; that is, in so far as the concatenation of the elements was concerned it was operative, but not as a flying machine.

I became convinced that if Joseph would yield to guidance he might soon become a successful inventor. But most of the real inventive geniuses lack in patience and sober deliberation and therefore seldom, if ever, heed practical advice. And thus, without telling him what I thought of his machine, I said: "Almost every budding genius begins his creative career with inventing a perpetual motion machine, a submarine boat, a flying machine, or some such problematical scheme. No doubt a striking improvement in flying machines is a valuable invention, Joseph, but not one-half as valuable as a striking improvement in drill presses, not one-tenth as valuable as a striking improvement in drill chucks, and not one-hundredth as valuable as a striking improvement in drills. Why in the name of common sense do you want to fool with flying machines?"

"Oh, well, so long as it is a valuable invention I would much rather fool with flying machines than with gasoline stoves or locks or drills or anything else, however more valuable these nick-nacks may be," he replied with absolute conviction of the wisdom of his course. "The honor of being the inventor of the best flying machine in the world is worth more to me than the difference in the money small inventions may yield."

"It is not a question of money yield, Joseph. It is a question of whether there is even the remotest possibility of your ever being able to carry out your project at all. Assuming that yours is the best flying machine in the world, and assuming that your construction is perfectly operative and eminently practicable. It would take from \$50,000 to \$100,000 to develop and build your machine, and after your machine is built you will be the one to go up in it the first time. You may have the nerve, or rather the foolhardiness, to go up in an untried flying machine, but have you the money or can you hope to get

capitalists to invest money on your sketch? You have no doubt noticed the frequently appearing advertisements in the papers, 'Wanted capital to patent and build the best flying machine ever invented.' Inquire of those inventors whether they had a single answer to their advertisements. Many foolish inventors come to Washington, D. C., expecting the Government to buy their plans, and return home sadder but wiser. Don't misspend your remarkable talents and ebullient energy, Joseph, as thousands of young inventors do." Joseph was thoughtful, but not convinced.

"Now, listen to me, Joseph," I continued, "if you have genius enough to invent a flying machine and mettle enough to work at it till 2 o'clock in the morning, why don't you try to invent some striking improvement in a machine, apparatus, device, tool, or thing for which there is a demand or a demand could be created?"

"But everything else is as perfect as it can be made and cannot be improved upon!" he protested.

"So we thought ten, twenty and fifty years ago; and three thousand years ago Solomon, the Wise, declared that there is nothing new under the sun. But as a matter of fact in this world nothing is perfect or will ever be perfect. In this age nothing is tolerably good that can be made better. In this country at least nothing that is in extensive use is so small or insignificant as to be unworthy of improvement. There is not a thing in this world that will not sooner or later be improved by some inventor. A few examples will furnish you incidents of striking improvements where least expected.

"Ever since the slotted screw head was invented thousands of mechanics used screw drivers every day of the week. The multimillions of mechanics that used screw drivers during those years certainly thought the simple tool perfect and therefore proof against improvement.

But the practical inventor, that is, the one who had examined the screw driver with an eye to finding out faulty performers of functions therein, found the simple thing faulty. The fault he found with the simple screw driver was the inconvenience experienced in its manipulation. In driving a screw the operator must release the screw driver handle about a dozen times or more and turn the palm of his hand on the head of the handle.

"Having found out the faulty function the rest was easy. Since the fault laid in the frequent release of the screw driver handle, it is evident that a ratchet and pawl or a jaw clutch interposed between the shank of the screw driver and the handle the shank could be turned continuously without releasing the handle—and the now popular ratchet screw driver was created.

"The introducing of the ratchet between the shank of the screw driver and the handle any mechanic, amateur mechanic or person having some knowledge of mechanics would have suggested if the inventor had only told him the fault he found with the thing or what function he wished the screw driver to perform. But without being told of the faulty performer of the function of the screw driver no one thought of introducing a ratchet between the shank and the handle. It is manifest that the most essential part of inventing lies in finding out the faulty performers of the principal function. The fault found the remedy suggests itself readily.

"This is true in most every instance of simple invention. Suppose one should show you the hasp of a barn door and tell you, 'I wish to do something to this hasp so that when I want to close the door without locking it I shall not have to look for a tapered stick that is small enough at one end to enter the staple and large enough at the other end to prevent its falling through. What do you suggest?' It would be the work of but a

few moments for you to conceive the idea that a hook riveted on the hasp would remedy this fault to perfection. The inventor who seeks to improve and simplify things already in use would conceive that by merely filing out or stamping the hasp so as to leave a projection extending into the slot he would thus form a hook and save the cost of the hook. He would thus accomplish the purpose, and banish the annoyance of finding chips of wood to fit the staple, without any additional expense.

"Our generation is the direct descendent of an age that knew untold drudgery. We are therefore still so callous that we readily put up with all sorts of annoyances without a murmur. In fact, we are so hardened and used to inconveniences that we never give them a thought. But once it is shown us a way to get rid of any one of the petty annoyances, we would put up with it no longer. Ever since the Greeks of Phoea in Ionia began to coin money [about twenty-six centuries ago] the ever-busy patrons of the man behind the counter have been scratching, cussing, and fussing the obdurate thin, flat coin that refused to leave the smooth counter or the show case. Yet none of the billions thus annoyed, nor any of the ever obliging, urbane busy bodies behind the counters ever reflected thereon until recently one invented a bristled rubber mat from which the coin is picked up as readily as if the clerk held it out between the thumb and forefinger. Instances of exceedingly valuable small and simple inventions and improvements are legion.

"Reverting to the improvement in the screw driver. As I said before, this simple tool was deemed faultless and, owing to its simplicity, immune against improvement. But, as usual, no sooner had one inventor found one faulty function in it than another inventor found another. This is the case in most every instance of radical

invention or improvement, and there is nothing inequitable about it nor prejudicial to the first inventor's interests. Indeed, in many instances, the second invention or improvement makes the first one commercially valuable when it was not so before. But this is no part of the theme of our present discussion. What I wish to show is that even on the apparently impossible, or the apparently most perfect things in extensive use, not only is improvement possible, but even improvement upon improvement is possible; and that clear-headed observation, introspection, and analysis are the means to be employed to elicit such improvement.

"As an illustration of clearheaded observation, introspection, and analysis, the second screw driver inventor wished to make himself useful and screw up the hinges while the carpenter was fitting a screen door in his home. After the inventor had given the screw driver a few turns he stopped musing. Suddenly a thought flit across his mind and he hit the screw on the head with a hammer. Observing that, unlike driving a nail, the screw turns under the blow of the hammer, he again stopped musing. A few minutes later, conceiving the means for effecting self turning of the screw, the elated inventor flung the screw driver he had borrowed from the carpenter toward its owner and snapped at him with an air of over-tensioned patience: 'Go to blazes with that infernal, irksome thing, mister carpenter.'

"The carpenter, a good mechanic, proud of his tools, or jewels, as good mechanics fondly call their tools, protested against insulting his precious jewel. 'I carry in my kit none but the best tools on the market,' he cried haughtily, 'and this is the best ratchet screw driver there is to be had, sir! You don't know a good thing when you see it.'

“‘Yes, the infernal wretched screw driver,’ retorted the inventor acrimoniously, ‘I have nearly twisted off my wrist with it. I kept on twisting and twisting and twisting and the screw is still half way out.’”

“‘What screw driver would you expect me to carry? One that will drive the screw without twisting your wrist?’ cried the offended mechanic indignantly.

“‘Yes, sir. A good screw driver should drive the screw without the operator turning his wrist,’ returned the inventor teasingly.

“‘That’s impossible, dear,’ interjected the inventor’s spouse. She was attracted by the noise of the altercation between the inventor and the carpenter and heard her husband’s flagrantly nonsensical demand.

“‘Yes it is, mother. Pushing the screw driver against the screw is labor enough for a twentieth century mechanic.’”

“‘It can’t be done, sir,’ cried the carpenter, chuckling merrily. ‘You must turn your wrist to turn the screw driver handle.’”

“‘Yes, it can. Just watch me do it. See? The screw turns under the blow of the hammer.’ The inventor drove a screw home with a hammer and called the carpenter’s attention to the fact that the screw turns under stress of pressure. The carpenter, though a good mechanic, but not a practising inventor, failed to perceive the effect to which the inventor called his attention.

“‘The carpenter laughed heartily. ‘Oh, you are off, sir! I have been driving screws ever since I was fourteen years old. The hammer won’t supplant the screw driver, sir. The screw must be turned or you will break the hinge, split the wood, or enlarge the hole.’”

“‘Yes, turned by another screw, not by the hand,’ rejoined the dignified observer. The carpenter caught the inkling and blushed to the very flat pencil under his ear.

"Straightening out lazily and scratching his head, the carpenter heaved a deep sigh and drawled out ruefully: 'I know now what you mean, sir. Why didn't I think of that before? I have been driving screws partly with hammer and partly with driver for nearly forty years. I knew that a screw turns under pressure almost ever since the first year of my apprenticeship, yet I did not have sense enough to make use of this knowledge.' And there we have the popular automatic screw driver.

"The automatic is a right and left screw, turning under pressure right and left, and by its own turning drives the screw in or out without turning the wrist. You see, the inventor first found out the faulty function; namely, that even with the improved ratchet screw driver the wrist had to be turned so many times before the screw was in place, then, looking for the remedy, he observed the effect pressure has on the screw.

"Moral, observe effects and trace effects to their causes.

"The foregoing is quite sufficient to illustrate principles of inventing improvements in things apparently already perfect. Everything, large or small, intricate or simple, that is now in existence and in extensive use, was invented and improved by observing and remedying the defects, and everything that is now considered perfect will sooner or later be improved in the same manner. The field in the line of improvements is unlimited and good improvements are always in demand."

"Attempt the end, and never stand to doubt;
Nothing's so hard, but search will find it out."

LESSON XIII.

Kinds of Improvements to Invent.

A few minutes of silence ensued after the last lesson, during which I busied myself with making certain notes of topics to discuss with the tyros. In the interim the tyros seemed very much engrossed with contemplation, obviously ruminating on the gist of the preceding exposition. My nephew, it seems, thought that it was the last of the lessons and squirmed in his seat as uneasily as a child given a short ride in a buggy does when he has to get off. At last he rose from his chair convulsively, as if anxious to go to work on something, and uttered almost unconsciously: "With such an extensive field for profitable inventing, and with the knowledge we now have of the art, all we have to do is to roll up our sleeves and go to work."

"Yes, but to guess what to invent that the people need or want is a different proposition," mumbled Miss Sharp contemplatively.

"Why, some patent attorneys distribute lists of inventions wanted and others distribute booklets suggesting what inventions to make," her brother informed them.

"Bosh!" exclaimed my nephew impatiently. "These lists and booklets are in the possession of hundreds of thousands of inventors. No sane person would avail himself of such munificent tips. What do you say, uncle?"

"I say forcible impressions resulting from studious observation and clear-headed introspection and analysis are the only suggestions that are likely to eventuate in profitable inventions. The useful arts are divided into two hundred and forty-one classes and each class is divided into sub-classes ranging in number from ten to over two hundred. Inventions are wanted in every one of the thousands of sub-classes."

"Then you will give us a list of the classes and sub-classes from which we may select a suitable object for inventing."

"The list of the classes and sub-classes makes a book of 85 pages. You can buy this book from the Patent Office for 10 cents, but it will be perfectly useless to you. I will reduce the contents of that 85-page book to ten lines of inventions or kinds of inventing. Each of these ten lines will direct your minds to a certain kind of inventing. If you aspire to make none but safe and sane inventions select one of these lines and make this particular kind of inventing your specialty—not to the exclusion of any of the other lines.

Line 1. "Make machines, tools, devices, or things now in extensive use do more than what they do now. In other words, enlarge the scope of their functions. To give you a fair idea of what enlarging the scope of functions means, I will give you a few examples.

"Until the invention of the monkey wrench a blacksmith had to carry in his kit of tools a dozen or more wrenches to fit the various sizes of nuts. By making the wrench adjustable this annoyance was banished and one wrench does the work of a dozen or more wrenches.

"Formerly a carpenter had to carry in his kit of tools a large assortment of auger bits. Now, the adjustable auger bit bores a number of sizes of holes.

"The steel yard and the platform weighing scales invention, which is a modification thereof, is a product of this kind of inventing. So is the adjustable screw plate, the extension table, the extension window screens, the adjustable window shades, and the thousand and one adjustable things now in extensive use. But the field is not yet filled. Thousands of inventions of this kind still remain to be made.

"Inventions of this kind are very valuable and in constant demand. To make them, follow the course of criticism I have outlined in connection with the nippers, screw driver, and log-sawing machine, which in fact applies to inventing generally. Things made adjustable to different sizes to save either time, money, labor, or annoyance in their manipulation yield immense profits to inventors.

2. "Concentration is the spirit of our present age; *multum in parvo*, the slogan. The huge oak bedsteads of our forefathers are now made light, portable, and folding. Even chicken houses, barns, and dwellings are now made portable and adjustable. Adjustable intervening walls in brick houses have recently been advocated. Several kinds of foodstuffs are now catered ready and half ready cooked, in pallets, tablets and powders.

"Make stationary things portable and rigid things adjustable, collapsible, extensible, contractible, or folding. If you can make one coat, one hat, or one pair of boots fit father, mother, son and daughter you will be making a commercially desirable invention.

3. "Make tools and things interchangeable.

"A poor farmer had a piece of land upon which it was hard to raise anything except his dander. In addition thereto the concealed rocks snapped off the plow points at an alarmingly high rate. This of course kept him per-

niciously poor. While sitting on the mould board bewailing the bereavement of a newly broken-off plow point, he conceived the idea of making the plow shares interchangeable. Simple as this invention is it was worth a fortune, because of the enormous savings of material—the mould boards, which had to be thrown away on account of the broken off points.

“Think of the commercial value of the interchangeable pen points, the interchangeable pencil points, and the numerous interchangeable things now on the market. Formerly, boots were worn all the year round; now, since the shoes were separated from the leggings, shoes alone are worn in the summer season and shoes with detachable leggings, which form composite boots, in the winter season.

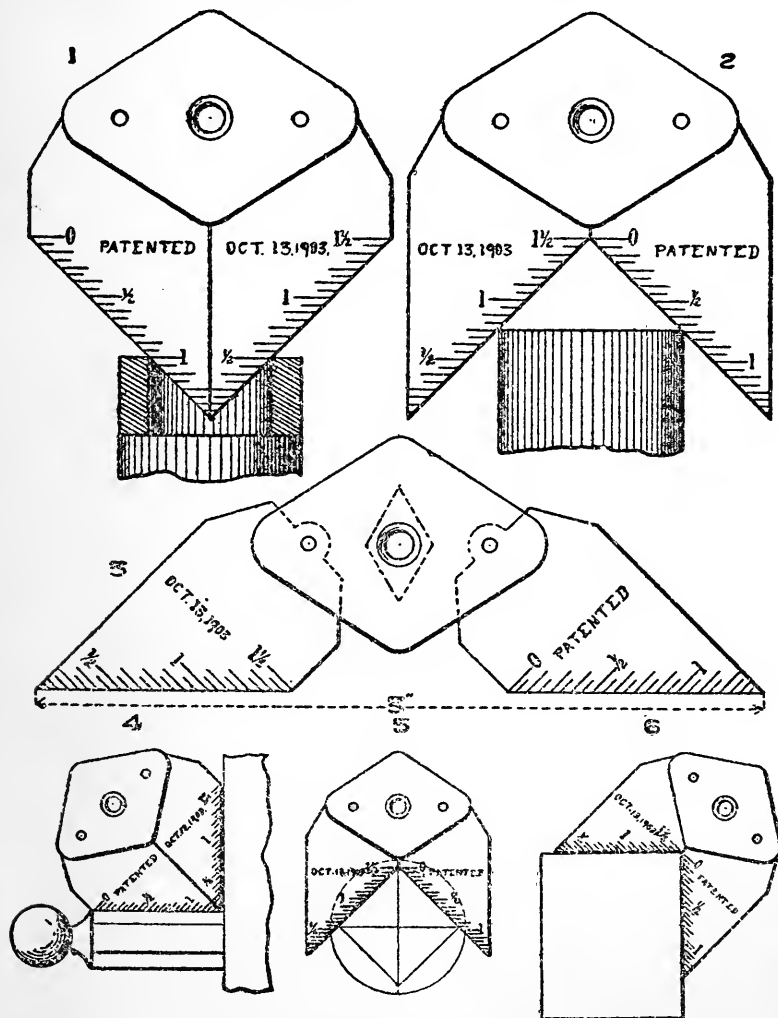
“The interchangeable collar and cuffs, the interchangeable buttons, and the interchangeable things of common use do not only effect a great saving in the cost of the articles, but are highly convenient and afford inexpensive means for enjoying variety. In some of the European countries vest fronts and shirt fronts are made interchangeable, convertible, reversible; and that idea has recently been imported to this country. Numerous things and tools are yet to be made interchangeable. Inventions of this kind are highly remunerative and eagerly sought after.

4. “Combine two or more functions of separate things in one body.

“Formerly every carpenter, every lather, and every thrifty householder had to have a hatchet wherewith to chop wood or trim laths, shingles, etc., a hammer to drive nails, and a pair of tongs to pull out bent nails. Now, one claw hatchet does the business of these three useful household and craftsmen’s implements. Combinations

of mechanics' tools, kitchen and household articles are very profitable, but they must be made judiciously to be patentable.

"There are several combination tools and measuring and squaring instruments for mechanics' use on the



market, but there is plenty of room for more. Invent combinations. Successful ones are very profitable. But, as I said before, combinations of two or more things or

devices must be made judiciously. The assemblage of a knife, fork, spoon, etc., or any combination of separate things in one body is not patentable, unless there is some novelty and utility in the nexus which unites the several devices. The several devices must depend on one another and jointly contribute to produce some new result. In a combined drill press and vice, the latter holds the work while the former operates thereon. In a combined typewriting and adding machine, the writing out of the bill and the amounts are performed simultaneously by the manipulation of the typewriter keys. The amounts are thus added up synchronously with the writing.

“In a patentable combination of two or more devices, the devices must be so co-ordinated as to co-act and produce a unitary result. On page 123 is a combination instrument in which two pieces of scale are so combined as to co-act and jointly produce self-registering calipers, squares, etc.

5. “Change the operative principle of things even if you effect no improvement thereby. Shoes are laced to hold them adjustably to the feet. Some shoes have buttons, others elastics, and still others buckles for the same purpose. There is no real advantage in one over the other, but people become weary over one style and long for a change. Then people have different tastes. One prefers one kind of shoe fastener and another, another kind. Competition is keenly active in every branch of manufacture, and variety and novelty to overcome or counteract competition is the present manufacturer’s chief concern and therefore in great demand everywhere.

“Take the typewriter, for instance. In some machines to write capitals the carriage is shifted, in others the type basket is shifted; in some machines the key levers are fulcrumed, and in others they are journaled. These are mere changes in the operative principles—the same thing only different.

6. "Make electrical or mechanical devices do what is now done by hand.

"Think of the monstrous advantage the touching of a button to open the front door has over walking down three, four or more flights of steps to do it. Think of setting type by hand and having a machine to do it. Compare the rubbing clothes on a washboard and turning the crank of a washing machine to do it. Compare the sweeping carpets with a broom and having a carpet sweeper to do it. Think of the thousand and one different means, ways, and devices to save time and manual labor that are already in extensive use, and you will appreciate the commercial desirability of such inventions.

"Thousands upon thousands of such means, ways, and devices still remain to be made. Inventions of this kind are highly remunerative and always in great demand. The field is practically unlimited, and to make them, the log-sawing machine is a fair exposition of the how, in fact, as I said before, of virtually all kinds of inventing.

7. "Make animal power do what is now done by man power.

"There are several styles and makes of horse power machines on the market, but, like the rotary log-sawing machines, they are not within the purchase price of poor farmers. Some of the present horse power machines are very cumbersome and some of them more or less awkward, and countless poor farmers still do a great deal of their hard work by hand, foot, or body. Farmers have horses and oxen. All they need is some simple, light, and inexpensive appliance to make the animal cut the feed, cut down the trees, pull stumps and do some of the numerous things that are still done by man power.

8. "Devise special means for special purposes to relieve the toiler of some of his numerous tasks. Inventions in this line have an unlimited market.

“Applicatory inventions, that is, inventions consisting of applying or adapting old and well known principles to new uses, are often very profitable. But such inventions are not always patentable. The legal aspect of this subject of invention, while quite simple, is not generally understood by inventors, and even by some patent attorneys, and many costly blunderings are the result. A thorough understanding thereof is therefore essential.

“Patentable invention must be new and unknown, but it does not necessarily have to be so absolutely. For instance, hair clipping devices for clipping human hair were old and well known in hair trimming implements. A farmer adapted the principle of hair clippers to clipping grass [the mowing machine]. For the purpose of clipping grass they were new; not known to have ever been used for that purpose, and therefore patentable. Still the mowing machine was not patentable because the hair clippers have never been used for the purpose of clipping grass. If one adapts the human hair clippers to clipping sheep, horses, or dog’s hair, even though clippers have never been used for that purpose, no patent will be granted therefor, because such adaption is mere analogous, or double, use. Hair is hair, animal or human. Again if the hair clippers in the present shape, form, and construction—size is immaterial—could be used effectively for cutting grass, the use would be analogous and no patent would be granted for their adaptation to grass clipping, even though clippers have never been used for that purpose. Then, again, if the hair clippers used to trim human hair could not be used to clip animals’ hair without making some change in the construction of the clippers, they would be patentable under that change.

“The rule of law is that the adaptation of an old principle to a new purpose is patentable only under the entity of the change that makes the thing available for that

purpose. The magnitude of the change is wholly immaterial. It may be a mere reversion of some of the elements entering into the combination, which, while simple enough to make, skillful mechanics could not see the possibility of. If by such apparently trivial change the old and well known principle becomes available for the new purpose, the adaptation of that old principle to that new purpose is patentable, and often commercially highly valuable. The inventor is entitled to predominating claims for the adaptation of the principle to the new use under the entity of the mechanical change in the structure of the thing.

9. "Articles of manufacture now in common use or new ones heretofore unknown yield considerable profits to inventors.

"The structural features of paper bags, envelopes, shoe laces, scarfs, and all sorts of wearing apparel, furniture, calendars, tickets, etc., belong to this kind of inventing. Everything that is duplicated by hand or machinery and is not a machine, art, or composition of matter is termed in patent law *manufacture*.

"All kinds of chemical compositions—except medicines—all sorts of pastes, polishes, dyes, varnishes, paints, enamels, and concoctions, are termed compositions of matter and legitimate subjects of the patent. Chemistry is a profound science. Unless one has made a thorough study of chemistry he is not in a position to make a practicable invention of this kind. Still, a new composition of matter is often the result of mere accident.

10. "New and attractive configurations may be covered by a design patent. Ornamental designs of watch cases, silverware, combs, cuff buttons, stove doors and bases, scroll work, and all sorts of arabesques and embellishments; new forms and shapes of machinery, furniture, lamps, and things come under this kind of inventing

for profit. Designing is an art and a matter of taste. What you may deem comely others may think homely. A properly made mechanical patent covers all kinds of equivalents of the elements in the machine shown and described, while a design patent covers nothing but the precise configuration shown and described and any colorable imitation thereof. The protection of the design patent is therefore very limited.

“Patents for designs are granted for three-and-a-half, seven, and fourteen years. The life of a popular design is usually very short. The popularity being ephemeral, a three-and-a-half or a seven year patent is ordinarily all the period of protection one needs. The government fees for the three periods are \$10, \$15 and \$30 respectively, and the attorney’s fees are usually \$25.”

"What we want is not learning but knowledge ; that is, the power to make learning answer its true end as a quickener of intelligence and widener of our intellectual sympathies."—*Lowell*.

LESSON XIV.

Electro-Mechanical Inventing.

On the evening of the following day my nephew informed me that he had entered into co-partnership with my stenographer, presumably on the strength of my suggestion that two like-minded persons of equal aptitude could accomplish more than one. But a few interrogations and cross examinations relative thereto brought out the fact that their verbal pact of conjugation covered a co-partnership of the illimited--responsibility-and-perpetual-continuance-without-renewal type. Briefly, the co-partners mutually agreed to co-operate primarily in the advancement of their joint and several felicity, and also in the advancement of the useful arts. I congratulated them heartily and concluded my congratulations with a fervent avuncular benediction.

After a few minutes of chat and facetiousness anent the co-partnership my nephew assumed a serious mien, moved his chair close to mine, and said: "Uncle, dear, I have accepted a job in a book printing office. My salary will be very small to maintain a decent home and a respectable standing in society, but, thanks to you, we have hopes of making some money out of inventing which will help us along. Both our inventions you say you have found on the records in the Patent Office partly anticipated

by prior patents, and, though still patentable, you do not consider them worth while; so we must abandon them. This, however, does not discourage us in the least. Indeed, it rather encourages us, since it shows that we are capable of conceiving new and patentable principles, only in the present instance we happened to be a little too late. Now, as we are capable of inventing, we shall work away for dear life's sake on the system you have outlined for us and make earnest and well directed efforts to educe something real practical and commercially valuable.

"You have given us a wonderful start in mechanics. During the past three days we have severally traced the leverage of a large number of mechanical movements in operation. In consequence whereof we have acquired knowledge of a large number of mechanical principles. But as you said, and we feel the need of it, the practical inventor must be a sort of pansophist; he must know everything, and electricity claims our earnest attention. In fact, it claims our immediate attention.

"Last evening when we left here we sauntered down Pennsylvania Avenue and leisurely promenaded up and down the Avenue sidewalk while we were conversing. A photographic display in a window attracted Lillian's [Miss Sharp's] attention, and we stopped to look at the pictures. A hexagon display cabinet bearing very interesting war pictures was revolving at a most provoking speed. Before we had time to discern the images, the cabinet whirled around. After several futile attempts to catch a glimpse of the war scenes we had to leave the window without seeing them.

"Discussing the disappointment, Lillian observed: 'Wouldn't it be better if that cabinet were actuated by an intermittent rotary movement controlled by electricity and have a push button outside the window, so that after the spectator had carefully examined the pictures on one

side of the cabinet he could push the button and have the thing present the next side?' I thought it would be a grand scheme and probably hailed with delight by window displayers, and consequently a commercial success. But neither of us knows a thing about electricity.

"Books on electricity, as on every other technical science, are very redundant; and we, advanced in years and burned with many cares, have neither time nor inclination to study them. We should be exceedingly grateful to you for showing us a short cut to a knowledge of electricity, if possible, uncle."

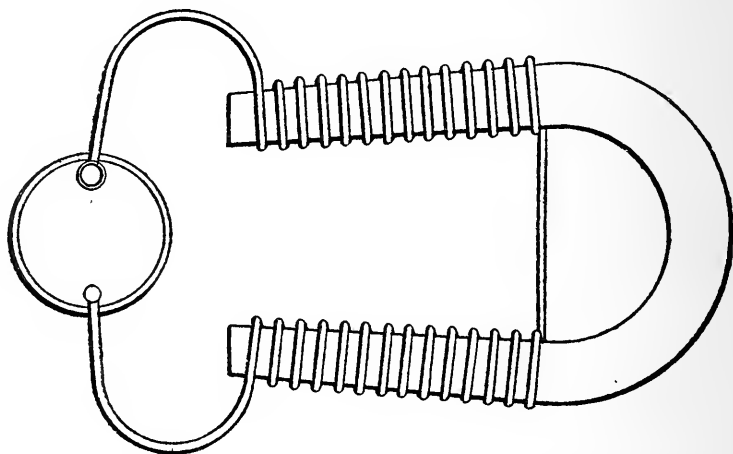
"Electricity is a profound science," I told them. "In its application it embraces within its scope mechanics, chemistry, physics, and mathematics. Books on the subject, it is true, appear to the beginner irksome and the subjects treated provokingly diffused. I shall try to give you a few points on the practical application of simple electricity.

"Electricity is an imponderable, invisible, powerful physical agent that makes its presence known through certain mediums, by heat and light, attraction and repulsion, deposition and decomposition of certain metals, and certain other phenomena. Whatever else electricity is, does, or is capable of performing, to the mechanical inventor nothing but its magnetic influence upon, or magnetic induction into, soft iron is of practical value.

"Take a piece of soft iron rod, bend it in the shape of a horse shoe, or an ordinary well annealed horse shoe for that matter, wrap each end thereof with a continuous length of insulated copper wire and attach the two ends of the wire to an electric battery, as in this sketch, and you have a powerful horse shoe magnet.

"Disconnect one end of the wire from the battery, or cut the wire at any point, and the iron instantly loses its magnetism. This is the only difference between an electro-

magnet and an ordinary horse shoe steel or loadstone magnet, and the only momentous feature that makes electricity available for practical mechanical use. The



former can be made to lose its magnetism instantly and thus release the thing, called armature, held thereby while the latter, retaining its magnetism permanently, anything held thereby cannot be detached therefrom except by a force greater than its own.

“Observe that in order to make the iron rod for a magnet, the wire wrapped around the two ends of the bent rod of the horse shoe must be continuous and when connected with the two poles of the battery forms what is termed a complete circuit. The electricity starting at the positive pole flows through the continuous wire to the negative pole of the battery, and so long as the current flows in the wire the iron is a magnet.

“To make the armature vibrate in rapid succession, as in an electric bell, a make-and-break is introduced in the complete circuit; and to facilitate the starting and stopping the vibrations of the armature, a push button is introduced in the circuit. Procure an electric bell outfit, connect it up in accordance with the directions usually fur-

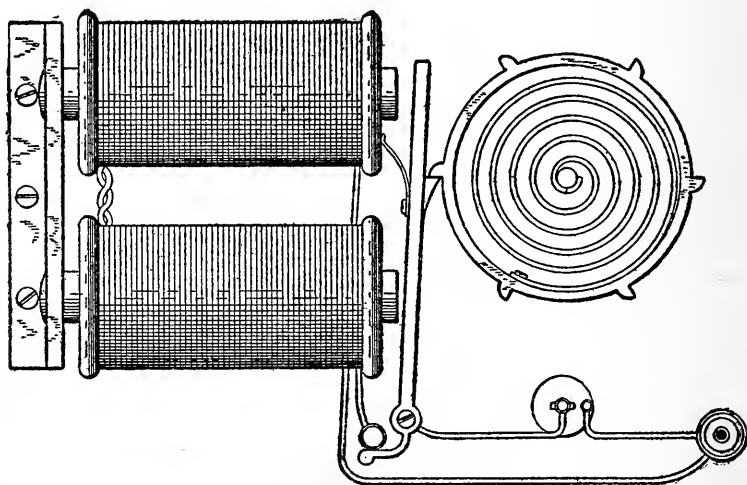
nished, and studiously observe the effects of the make-and-break feature in the bell. The slight flashes of light seen between the platinum point in the end of the adjusting screw and the platinum disk on the spring are due to the imperfect break in the circuit which occurs at that point. The instant the circuit is completed by the contact of the two pieces of metal in the push button, the armature in the bell is attracted by the electro-magnet. The contact spring, being attached to the armature, is by the attraction of the armature withdrawn from contact with the platinum pointed screw. The circuit being thus broken, the magnet loses its magnetism and the spring, by its own tension, returns to its normal position and re-establishes the contact, or makes the circuit. The making and breaking of the circuit in rapid succession causes the armature to vibrate rapidly.

"The principle of the electric bell is present in the electric shocking devices, and with some modification in the make-and-break and in the construction of the push button in the electrical annunciator, telegraph apparatus, fire alarm, etc.

"Procure a toy electric motor, trace the circuit and find out why the armature revolves rapidly. The two ends of every magnet are called 'poles.' One end is called 'north pole,' because when a bar magnet is suspended in the air that end will point toward the north, and the other is for the reason of pointing southwest called the 'south pole.' The continuous rotation of the armature in an electric motor is effected by the well-known peculiarities of the magnet that like poles of two magnets repel each other and unlike poles attract each other. It is the successive changes of the polarity, and the consequent alternate attractions and repulsions, that produces the continuous rotary motion of the armature in an electric motor.

"A dynamo is in its principles of construction practically the same as an electric motor. Study the electric bell and the toy motor and look for the same features in similar devices, and you will soon become pretty well educated in applied electro-mechanical electricity.

"Now to produce electro-mechanical means for imparting intermittent rotary motion to the hexagon display cabinet you spoke of, the arrangement shown in this sketch may serve to illustrate a simple controlling mechanism.



"One end of the continuous wire of the electro-magnet is connected to the push button and the other to a binding post containing an adjusting screw. The ratchet wheel, to be attached in the center of the bottom of the rotatable hexagon cabinet, has six teeth and is provided with a spiral spring under the influence of which the cabinet tends to rotate in one direction. The armature is provided with a pawl piece which is normally in engagement with one of the teeth in the ratchet wheel, also a spring for holding said pawl piece normally in en-

gagement with one of the teeth in said ratchet, and an extension normally in contact with the adjusting screw previously mentioned. The positive pole of the battery is connected to the armature and the negative pole to the push button.

"A touch on the button would cause the electro-magnet to attract the armature and thereby release the ratchet. The cabinet would then rotate, but it will be instantly intercepted by the released armature and thus prevented from rotating more than one-sixth of a revolution. Of course the cabinet would have to be wound up every morning or so, but this is merely a suggestion of accomplishing the result you conceived by means of an electro-magnet and the simplicity and cheapness of the device should commend itself. An electro-magnetic mechanism has the very great advantage that the pliable wires can be led through all sorts of nooks and corners and the mechanism can be actuated by a mere touch on a push button.

"A spiral spring is a poor motive force and should not be employed except for driving very light movements for a brief period of time. To attain any degree of regularity in the expansion of the spring, it must be held under control by some sort of an escapement as in a clock or a spring motor. It may, however, do in the present instance or for similar purposes. The spring being in the present instant controlled by the armature.

"Unless one has made a thorough study of the theory and practice of electricity he should not attempt to invent a new motor, dynamo, or battery. Electric motors are now made in all sorts of styles, shapes, forms, speeds, and sizes for all practical purposes, and at prices within the reach of the humblest. Batteries are now made in all sorts of styles, shapes, and sizes; dry and wet, for open-circuit—transient use—and for closed circuit—con-

tinuous use. Dry open circuit batteries are now to be had as small as half of an inch in diameter and less than three inches in length. But remember this: The electromotive force of all styles and makes of batteries ranges from one to two volts per cell. To light an ordinary 16-candlepower incandescent electric light requires 110 volts and the life of the best battery under such continuous use is at the utmost only a few hours. Therefore do not make the mistakes some inventors occasionally do and invent an electrically driven elevator actuated by a few dry batteries conveniently stowed away under the tender's seat, or some such absurdity.

“For driving electrically-propelled vehicles and certain other purposes, storage batteries are used. But until you are thoroughly familiar with the peculiar nature of storage batteries, open and closed circuit batteries, dynamos, motors, etc., do not attempt to make inventions or improvements in any of them or depend upon the propelling power of any of them, except perhaps for actuating light mechanical movements which for transient use can be operated by a few cells of liquid or dry batteries.

"The best may slip and the most cautious fall,
He is more than mortal that ne'er err'd at all."

LESSON XV.

Foolish Inventions.

During the few minutes intermission that ensued my nephew seemed to indulge in some thought his sweetheart could not divine. Ever apprehensive he might be thinking of something he should not, she sidled over to him, fondled him, and to divert him from his thought broached: "Well, dear, we have been duly initiated in the craft of mechanical creators and, judging from the trials we have made at inventing, your uncle assured me this morning that we have the making of practical inventors. Now what do you think will happen?"

"Why, my darling, I hope we will invent something that will yield us a little fortune, and then we will try to make things happen to suit ourselves. We will buy a nice little home, furnish it prettily, install a little laboratory or workshop, and with these facilities we will be in a position to make better inventions." William Swift is not a mechanic, but he has a natural mechanical turn of mind and is very fond of tinkering with tools. It is probably because of the natural inclination to make things that he turned out later a clever inventor.

His sweetheart became alarmed. "He is entertaining hope which may not materialize very soon and then he may again become distressed," she thought to herself. She was undecided as to whether she should encourage or discourage his expectations. Finally, after a few

moments' cogitation, she assented: "Yes, dear, I hope it will all come true and soon too. But we must not be too sanguine. That something that will yield us a little fortune may not happen as soon as you expect. I am as optimistic as you are, and perhaps more so, and certainly do not wish to discourage you. But your uncle told me this morning that we must not bank on the possible proceeds resulting from our inventing. For while it is quite possible for us to conceive some invention of intrinsic commercial value very soon, it is also possible that we may first make a few foolish inventions, and perhaps one or two freak inventions, and then some practical invention but of small commercial value, and finally strike something that will eventuate in appreciable financial success. Don't count your chickens before they are hatched, dear. The human mind is often freakish and at times strangely capricious, and when you have to depend entirely upon its working, as the inventor must, there is no telling what pranks it may play you. I have heard some eminent inventors tell that they have neglected to patent certain inventions of theirs because they did not think them practicable enough to be worth the cost of the patents, which other inventors have later patented and made phenomenal successes of them. But they did patent some ludicrous mechanical freaks. But it was through these hard knocks that they have finally developed into practical and successful inventors and made their fortunes."

The two young men seemed greatly disturbed. Like every young and inexperienced inventor, they did not count upon possible failure. "Making money by inventing," I interposed, "looks easy enough, and indeed is easy enough. All one has to do is to invent some simple thing that is capable of being brought in extensive use and make one or two million dollars out of it. Others

have done it and some are doing it now. But the simple things of extensive use, you will find out at the first attempt, refuse to come. Indeed, they seem to be entirely exhausted. The inventor of the gimlet point, which eventuated in the wood screw, is said to have lost his mind in seeking after another simple thing of such extensive use. Nor is anything absolutely original at this stage of our industrial progress so easy or even at all possible to conceive. You will have to look for some striking improvements on things already in use. Appreciable improvements can only be made on the more or less complex things. Practically all of the successful inventions are now made by completely reorganizing the whole machine or apparatus so as to make it do better or more work than before or to do something it did not do before. At the deciding whether the reorganized old thing is a needed improvement or not the tendency to err is very great; not only on the part of the inventor, but on the part of the manufacturer and his business directors. Indeed, most of the errors attributed to inventors are errors of judgment on the side of the attributers, not on the side of the inventors.

“As an example of erratic judgment on the part of men who ought to be able to judge correctly, an improvement on—in fact, a mere reorganization of—a certain kind of machine in extensive use was once offered to the manufacturers of such machine for only a few thousand dollars. As a rule, and wrongly so, inventors offer their creations to the most prosperous of the manufacturers in that line. The most prosperous of the manufacturers of that machine, to whom the machine was first offered, were a twenty-million dollar corporation with offices all over the world selling their make of that machine, and a few thousand dollars meant very little to them. After that newly invented reorganization went the rounds of

inspection by the numerous experts employed by that company, and then well considered by the board of directors of that company, it was adjudged to be of no value to the company and returned to the inventor. And once the most prosperous of the manufacturers in a certain line decline to consider an improvement, all the others seem to follow their judgment. The inventor subsequently induced an individual who happened to have a few thousand dollars to his name to go in with him and both started to manufacture the reorganized machine on a small scale. The new machine soon became very popular, so much so that it nearly crowded the old firms out of existence. That great corporation would later have paid not only a few thousand dollars, but a few million dollars perhaps for that invention, but it was too late and all they could do was to wait until the patent had expired and then reorganize their machine on the lines of that popular machine, and so did all the other manufacturers of such machines

“As a matter of fact every invention is a freak, out of the ordinary, or else it would not be an invention at all, and because of that the most sagacious business man cannot possibly foretell the probable success or failure of an invention. The announcement of the invention of the sewing machine, typewriter, telegraph, telephone, aeroplane, and practically of every large or small invention now in extensive use has been relentlessly derided by some of the most sagacious business men here and abroad. Your own judgment will deceive you many times, but the defective judgment of others will affect you perhaps more than your own and be responsible for most of your failures. Never be daunted by the most lacerating ridicule or antagonistic criticism on your invention. Gather all the information on the subject you can. Consult those who ought to know. Court criticism.

Listen attentively to everybody and use your own judgment. If you fail and have nobody to blame for it, the lesson will be worth the price you may pay for it. If you have to blame others for your failure, the lesson will be lost on you.

"Thorough education in a certain line together with some experience makes the person of twenty years of age as wise in that line as the one of seventy years without a preliminary training. With the specific instructions, information, and advice I have given you, you are far advanced above the uninformed young inventor. But the inventor, even at seventy with all his large and varied experience and huge stock of accumulated facts at that age, makes foolish inventions. Thomas A. Edison is the most renowned inventor of this inventive age, and he makes foolish inventions, and many of them, too.

"The world calls every invention that does not go into practical use a foolish invention. A great number of inventions did not come into practical use until several years after the patent had expired, because their inventors lacked the requisite knowledge to work them out properly or the tact and energy to present them properly. For the same reasons a large number of inventions did not come into practical use until two or three years before the expiration of the patent. But when they did come into use the remaining brief period yielded the inventors immense fortunes. The roller skate is one of the latter, presumably foolish, inventions. The patent was lying idle for fourteen years, and when the inventor finally took the proper steps and put his invention in operation, the last three years yielded him about one million dollars in royalties. As a rule, an invention that does not come into practical use is not a foolish invention. It is simply the product of an uninformed, timid, or lax inventor. An invention that possesses marked utility, as

every invention should, will sooner or later come into practical use. Manufacturers are constantly seeking for improvements, and if real improvement is present, proper business tact and energy will put it to use or otherwise convert it into cash.

“It must, however, be admitted that there are tens of thousands of patents which will never materialize or ever be cashed, simply because they are in effect but shadows of patents [fool patents, if you please]. Some of those patents enunciate no invention and others that do enunciate appreciable invention failed to claim it. In either case such patents are of no value whatever. And there are some foolish inventions, often made by inventors possessed of considerable inventive ingenuity, sagacity, and acumen, that are just foolish inventions and nothing else. I could fill several volumes with illustrations of the most curious types of mechanical freaks I often encounter among the patents in the Patent Office. These foolish inventions are flagrantly due to the impatience of their inventors while racking their brains for subjects for inventing. These inventors have never learned how to look for a promising subject of invention by means of studious observation, introspection, and analysis, and being unwilling to wait for an inspiration concoct some kickshaw and apply for a patent.”

"The care of our national commerce redounds more to the riches and prosperity of the public than any other act of government."

LESSON XVI.

The Third Essential of a Commercially Valuable Invention.

"We have learned all about the proper way of making inventions, the kinds of inventions to make, etc. But, however great a public need the machine of your invention may supply, and however well the machine of your invention may be elaborated, unless its invention is protected by a tenable patent it is commercially valueless. It would seem that every person who owns a patent should know at least what a patent is. But as a matter of fact many inventors have but a vague idea of what a patent really is.

"A patent is an instrument issued by the government with the aid of which the inventor is enabled to defend his own product. Product is of two kinds: Tangible and intangible. Tangible product is easily protected. Artists, jewelers, artisans, and manufacturers exhibit their tangible products to prospective buyers with perfect safety. The producer explains minutely the intrinsic value of his product, but the listener cannot obtain that product without compensation. Should he attempt to seize the tangible product and run away with it, the police would run after him and club or shoot him down, if necessary, recapture the stolen product, and return it to its owner. But intangible product cannot be protected by physical force.

"Suppose the inventor of a valuable improvement in a certain article should come to the manufacturer of that article and explain his intangible product to him. The manufacturer may thank him for the suggestion, or even not thank him at all, and with perfect impunity manufacture and sell the improvement without paying the inventor a single dollar for the product of his brain.

"Unlike tangible products, intangible products, like building lots or farm lands, bear no permanently emblazoned or impressed mark, stamp, or serial number by which the inventor could prove the ownership of his ideas. The patent, like the deed to realty, describes the nature and extent of the inventor's intangible product and stamps and marks the description with the seal of the United States Government and a serial number, and thereby renders the intangible product tangible. Being a tangible product the patented brain product has an intrinsic commercial value, like that of a deed conveying realty, commensurate with the extent of the area it conveys to the holder thereof and the art it advances.

"A patent, like a deed of realty, is a property right of intrinsic commercial value. It can be mortgaged, leased, or sold, in whole or in parts. The only difference between the patent and the deed is that the possession of the property right conveyed by the deed is permanent, and the possession of the property right conveyed by the patent is limited to seventeen years. For seventeen years from the date of issue of the patent the patentee has an absolute monopoly in the thing he patented, and no other person within the United States and the territories thereof has the right to make, use, or sell the patented portion of the machine or thing without the written consent of the patentee.

"The grant of the patent is not only not absolute, but positively conditional, and the conditions upon which the

patent is granted are not merely implied, but very clearly and expressly defined. The validity of the patent is dependent upon two conditions: First, the specification must define the principles of the invention and describe the construction of the machine, apparatus, or whatever the invention may be, *in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which the invention appertains, or with which it is most nearly connected, to make, construct, compound, and use the same* without applying anything but ordinary skill. Second, the claim or claims must *particularly point out and distinctly claim the part, improvement, or combination* of the patented invention. Failure to comply with either of these two conditions invalidates the patent—and many are the patents that fail to comply with either one or the other of these two conditions, and some of them with both.”

"Pettifoggers in law and empirics in medicine have held from time immemorial the fee simple to a vast estate, subject to no alienation, diminution, revolution nor tax—the folly and ignorance of mankind."—*Colton*.

LESSON XVII.

The Free Preliminary Examination.

The next evening Joseph Sharp came up somewhat earlier than usual and unceremoniously took a seat at my desk and laid down a sketch and a check for \$30, made out by his mother in my name, and in a grave and dignified business-like way said: "I want an application for a patent on this little invention prepared and filed as soon as possible."

"Why did you make your mother draw a check for \$30, Joseph? Five dollars is all I charge for a preliminary examination."

"It doesn't need any preliminary examination."

"Why so, Joseph?"

"I know it is patentable," he answered, squinting at his sister and smiling wisely.

I examined the sketch and handed it to my nephew, who came in a few minutes after Joseph had entered and itched to see the latter's invention. It showed a remarkably clever clutch mechanism. The principles involved and the construction of the clutch elements were new to me, and I had good reason to believe that they were broadly new in view of the state of the art. But who can tell that there is not something like it on record! "What makes you think that your invention

is patentable and does not need a preliminary examination?" I asked the young inventor, somewhat puzzled at his asseverative tone.

"I made sure of it before I came up," he asserted with an air of the man who knows his business and never deviates from the prescribed rules.

His sister had told me a day or two before that Joseph had made the rounds of local patent attorneys and had written to many out-of-town attorneys for free literature and had thus gathered a mass of 'client-hatching' literature which he was busily perusing with great relish. I therefore readily guessed how he made "sure" of it. But I have seen enough of the improvident inventor to know his touchiness when his wisdom is questioned. I therefore pretended to study his sketch while I was thinking of how to handle him. His sister, though not wholly unaware of the manner in which he had made "sure," became impatient and inquired:

"How did you make sure of it before you came up here, Joseph?"

"That's my business, sis," he answered with arrogant self importance.

"We may want to find out whether our inventions are patentable without bothering uncle about it," argued my nephew. "Do, please, tell us how you made sure that your invention is patentable before you came up here."

"Yes, go ahead and tell them all about it," I rejoined. "They have still a great many things to learn about the business of successful inventing, which cannot be affected without successful patenting, and every ray of knowledge helps the earnestly striving inventor. Tell them how you made sure of it, Joseph. You are not so selfish as to keep such important information from your own sister and future brother-in-law, are you?"

"Well, I don't mind telling all about it," he drawled with affected hesitancy. In reality he was anxious to tell of his clever business management of which he thought himself quite capable.

"I finished the sketch of my sure-grip-and-quick-release clutch last night and showed it to my mother. She thought it was a good thing and gave me \$5 to pay you for the preliminary examination. This morning, while I was waiting for the breakfast, I picked up a monthly magazine and noticed an advertisement by a prominent patent attorney company of this city which read something like this: 'Send us a model, photograph, or sketch and description of your invention and we will advise you free of charge whether your invention is patentable.' I showed the advertisement to my mother and she said: 'If that company is willing to tell you whether or not your invention is patentable free of charge, what's the use of paying \$5 for the same information. Go right up and let them tell you whether or not your invention is patentable.' So I made a duplicate sketch and took it up to Messrs. D—— & Co., the advertisers. Mr. D—— told me to call again at 1 P. M., and when I called again he informed me that in his opinion my invention is patentable, and urged me to give him a deposit of \$10 or \$20 and he will start on the official drawings at once. I told him that I did not have any money with me and left the sketch.

"In the same magazine there was another advertisement by Messrs. F—— & Co., a very large and prominent patent attorney company. This advertisement read something like this: '\$5,000,000 offered for one invention, \$1,000,000 for another, \$20,000 for still another; write for list of inventions wanted and a booklet of suggestions as to what to invent; send sketch and description of your invention for free search; money re-

turned if no patent is allowed,' etc. I had not noticed this advertisement until I returned from Messrs. D—— & Co., so I quickly made another sketch and ran right over to Messrs. F—— & Co.'s office. The business manager of F—— & Co. told me that their trained experts and specialists can get a patent on most anything, and that he is quite sure that they can get me a patent; and if they fail to procure the allowance of a patent the \$25 which they charge for preparing and prosecuting the application will be returned to me, so that if no patent is allowed I will lose only \$20 instead of \$50. I interviewed two more patent attorneys and one of them told me that he has had thirty years experience in searching the patent records and knows a patentable invention when he sees one. He assured me that my invention is patentable and urged me to give him a deposit of \$10 and he will start on the case at once. So I have the assurance of two big patent attorney companies and one attorney who has had thirty years experience in searching the patent records that my invention is patentable."

"And what did the fourth patent attorney say?" inquired my nephew eagerly. The lad hesitated.

"Well—he said that he had no doubt that my clutch mechanism contained considerable novelty, but asked for \$5 to tell me how much of it is patentable. What do I care to know how much of my invention is patentable so long as I know it is patentable!" Such is the logic of the improvident inventor.

The imaginary sick and ever ailing called into existence a class of free-consultation and no-cure-no-pay doctors, and the uninformed, improvident inventors called into existence a class of free-search and no-patent-no-pay [contingency-fee] patent attorneys. The specious advertisements of such doctors and such attorneys and the millions of booklets and circulars, lists of symptoms

and list of inventions wanted annually distributed by such doctors and such attorneys, hatch out such patients and inventors galore. The uninformed aspirants to win fortune by inventing are led to believe that all one needs is a patent of some kind and fortune is his, and therefore they do not care to know how much of their inventions are patentable so long as they are told that their inventions are patentable.

The ultimate fate of the inventor is largely dependent upon the skill and integrity of his patent attorney. Having undertaken to inform the tyros on successful inventing and patenting, I felt that it was my solemn duty to inform them on the business practices in vogue among patent attorneys. And thus, after some talk on the free-search and contingency-fee schemes as practiced by some of the large patent-shoving companies and individuals (which is deemed inadvisable to publish in this volume), I told the tyros:

“In general, two widely different business methods are practiced by patent attorneys. One class of patent attorneys charge, in ordinary cases, \$5 for the search and examination of anticipatory references, and the other make no charge whatever. The attorneys in the latter class, after the free-search-seeking inventor had submitted the model or sketch of his invention, require him to deposit \$10 or \$20 in evidence of good faith that when they will report the invention ‘patentable’ the inventor will remit the balance of the cost of the application and order the application prepared and filed. To inspire confidence in the report and thus make the inventor file an application without knowing what patents there stand on record against his invention, most of the free-search attorneys promise to return the fee for preparing the application if no patent [a patent of some sort] is allowed.

"If the entire invention happens to be anticipated by prior patents and but a shade of novelty is left, however insignificant and valueless that residue may be, it is the business policy of most of the contingency-fee attorneys to draw one or more specific claims in effective combination with the worthless shade of novelty and thus procure the allowance of a patent. A patent with such claims is, in effect, a mere shadow of a patent [a fool patent, some inventors call it], and therefore without intrinsic commercial value. But it is a patent nevertheless—printed on parchment paper and sealed with the great seal of the United States Patent Office—and entitles the attorney to his fees.

"The loss of the \$65, the cost of the guaranteed or promised patent, is not the worse punishment the victim of the contingency-fee plan incurs. A train of useless expenses and loss of much valuable time usually follow in the wake of such patents. Knowing nothing of the existence of prior patents, the free-preliminary-examination and contingency-fee victim thinks he has a patent that secures to him the exclusive right to his invention, and in consequence he spares neither time nor money in building a machine or device which, not being his invention, will have to be consigned to the junk pile. Next he pays out two or three fees to those I-SELL-PATENTS men who thrive upon such victims in the hope of retrieving some of the money he invested in the patent and model. And last he spends some money in advertising the patent. This is the fate of tens of thousands of penny-wise-and-pound-foolish inventors—a loss of several hundred dollars in time and money and most lacerating tantalization, all for \$5.

"The attorneys in the former class charge a fee of \$5 for a preliminary examination of a simple invention. For the fee of \$5 the attorney searches the records in the

class to which the invention appertains and submits to the inventor one or more copies of patents that most nearly anticipate parts or principles of his invention for his inspection and study, and points out the novelty in his invention in view of the state of the art. An invention that is not anticipated by one or more patents is at the present stage of our industrial progress practically impossible. And thus one or more references always accompany the attorney's report. With the copies of patents before him, the inventor can readily see whether the parts or principles of his invention that are not anticipated by the machines shown and described in the prior patents will make the machine of his invention sufficiently superior to, and appreciably patentable over, those covered by the prior patents to justify the investment of the cost of a good patent. If he finds that what is left of the invention is not enough to justify the investment of the cost of the patent, he drops the idea and is only out \$5. More frequently, however, it happens that with the knowledge of what has already been accomplished in the line of his invention, as disclosed by the references before him, the inventor is able to recast his scheme and improve his invention to such an extent that the machines shown in the prior patents become wholly insignificant as possible competitors and their patents are no longer a bar to a good patent.

"The improvements in his invention the references facilitate are often worth to the inventor many times the cost of the preliminary examination. At any rate, by merely paying for the preliminary examination the inventor is in full control of the situation and sees what he is doing, and by saving the cost of the search he willfully allows himself to be blindfolded and hoodwinked."

From his mien and apparent apathy it was perfectly obvious that Joseph paid no attention whatever to the

subject we discussed. He seemed to be very impatient, obviously thinking he was losing valuable time, and probably regretting that he did not place his case in the hands of F—— & Co., and so I addressed him with particular stress to arouse him from his lethargy:

"Now, Joseph, suppose, for example, that this mechanism of yours has already been patented by some other inventor, and Messrs. F—— & Co. get you a patent on this cam-check feature of your clutch mechanism. How much do you think you could get for the patent?"

"I don't know," he answered sheepishly. "But I think I will substitute a bell-crank lever for the cam, which will be much cheaper to make and more responsive in its action," he added with a nervous tremor. His mind was obviously dwelling on his invention, and the mere mention of that flagrantly useless feature suggested the need of a change in its construction.

"He did not quite understand you," remarked his sister apologetically. "But the fact that he can substitute some other element therefor shows that the patent on the cam-check feature alone would not be worth much, if anything." Touching his shoulder she inquired: "Would you pay \$65 for a patent on this cam alone?"

"I guess, not," he answered protractedly in emphasis. "I wouldn't pay \$5 for a patent on this thing alone, because it isn't really necessary. A pin or a collar on the countershaft would check the movement of the clutch sleeve just as effectively as the cam or bell crank lever. I think I'll just put a plain collar with a flange on the countershaft instead of the cam or a bell-crank check."

"Now, you see, Joseph," rejoined his sister, somewhat embarrassed by her minion brother's apparent unintelligence, "if you had taken your case to F—— & Co., or to any of the free-preliminary-examination attorneys that do not furnish the inventor with the references on record

and truthfully point out what is new in view of the state of the art, and if all the clutch mechanism happened to be anticipated by prior patents, except the unnecessary cam-check feature, which in view of its impracticability and unessentiality is most likely to be free from anticipation, you would have unknowingly paid \$65 for a patent on that useless cam-check alone." Joseph was shocked. He could hardly believe it and stared at her in bewilderment.

"Do you mean to say that Messrs. F—— & Co. would have given me a patent on the cam-check and told me that it was a patent on the clutch mechanism?"

"They would have given you a patent on the cam-check, and as you did not care to know how much of your invention is patentable, there would have been no occasion of their telling you anything."

"But suppose I had asked Messrs. F—— & Co. or Messrs. D—— & Co. how much of my invention is patentable, wouldn't they have had to tell me the truth?" The tyros looked at me for an answer.

"They would probably have answered you: 'We have procured for you a patent as broad as your invention,' and that would have been the truth. No one can ask for a patent broader than his invention. The fact that you did not know that the cam-check feature was all the invention you had, would not entitle you to any consideration. They agreed to give you a patent and they gave you a patent; on the cam check, it is true, but that was all the invention you had. As to a legal right the inventor has absolutely none. Whether he understood what he had read in the little Hand Book on Patents or Inventor's Guide or not, matters little. The hand or guide book sets forth the conditions and the money the inventor deposits in evidence of good faith is a perfectly legal acceptance of those conditions. The Federal laws impose a duty upon

every citizen to exercise due discretion in dealing with his fellow men—Caveat Emptor—and therefore the government refuses to aid any person who in his attempt to get something for nothing gets nothing for his money.

“The folly of filing an application for a patent without knowing what there is on record is too obvious to require exposition. . It is my duty to guard you against taking any step that is prejudicial to your interests. I therefore enjoin you most emphatically never to order an application filed without having the references or, when there are many of them, the closest references on record before you. Competent patent attorneys demand adequate compensation for their services, and a fee of \$5 for a studious search of the patent records and a clear-headed, non-biased opinion as to what is and what is not patentable in your invention in view of the state of the art, is little enough. Pay the \$5 and have a thorough examination made, and made by none other than a thoroughly competent, practical patent attorney. A preliminary examination is not a validity search, and the most competent patent attorney in the United States cannot make the examination so thorough as to be sure that no anticipatory patent has been overlooked. But there is a marked difference in the work of one patent attorney and another in the breadth of searching and care in examining references not only in point of earnestness, but in the degree of ability. A thorough preliminary examination made by a competent patent attorney is worth all you pay for it, and more, too. Save on everything else but on the preliminary examination and on the cost of the patent. If your invention is a public need or want, financial success depends entirely upon the strength of the patent, and an attempt to save a few dollars on the making of the patent is almost sure to culminate in disaster.

“Common sense is said to be an uncommon thing; obviously because so few evoke its valuable assistance. If an attorney claims that in the hope of getting the job of preparing the application he is willing to make a thorough preliminary search without charge, common sense would show that the very animus is prejudicial to your interests. The searcher who gets paid for his labor searches to find out what is not patentable in view of the state of the art, while he who does not get paid usually searches only to find out whether there is anything in the invention under examination that is patentable in view of the state of the art, in order to get the job of making some kind of a patent. Do you understand me, Joseph?”

“Yes, I do. Go ahead and make an examination. I know there is nothing like it in the Patent Office. Nobody could have thought of such a clutch mechanism. But I am willing to pay \$5 for a thorough examination.”

"Some there be that shadows kiss;
Some have but a shadow's bliss."

—*Shakespeare.*

LESSON XVIII.

Fool Patents.

The next evening Joseph and my nephew entered my office breathlessly, as if they were racing, both anxious to learn the results of the preliminary examination. I showed my young client three copies of patents each of which anticipated a certain part of his clutch mechanism and told him that in view of the patents on record the main principle of the sure-grip-and-quick-release feature of the clutch is broadly new and, of course, patentable. The lad was elated beyond expression, and repeated: "I knew there was nothing like it in the Patent Office," a dozen times.

My nephew looked at the copies of clutch patents and suggested to Joseph a change in the construction of one of the anticipated features. Joseph re-examined the three references and in ten minutes' time changed all the three anticipated parts to considerable advantage, and cleverly avoided all the three anticipations.

After the keen edge of his ebullient elation wore off, Joseph said: "I want my application filed tomorrow and the patent pulled through so soon as possible.." After a few moments cogitation on the importance of the theme suggested by his nervous haste, I called the tyros to order and told them:

"'It is a good thing to learn caution by the misfortunes of others,' said a certain sage. Tens of thousands of in-

ventors are hugging shadows of patents. If you aspire to win fortune by inventing, you must first of all avoid the mistakes that are responsible for the existence of such patents. I have told you how some of the fool patents happen. I will now tell you how most of the remaining happen.

"Improvident and uninformed inventors make many mistakes. One of the gravest mistakes they make is haste. Undue haste is responsible for many failures. Almost every one of those inventors urges his attorney to hurry up and get the patent through so soon as possible. The latter [if he is one of the patent-shoving kind] to please his client, draws the claims so as to avoid official criticism and citation of references, and by this means he gets the application allowed at the first or second action.

"Now suppose you hired a surveyor to survey a tract of land you had bought and urged him to hurry up and finish the job in a day or two in order to give you the deed so soon as possible, and he, to please you, hastily surveyed whatever open land there was, some of which happened to belong to your neighbor, and gave you a deed for all the open land he had surveyed. All the valuable wooded land, which would have taken time to cut a path through in order to survey it properly, would thus be entirely lost to you and all that open land which belongs to your neighbor would have to be returned, and what you would have left would be perhaps only a small fraction of the land you were entitled to and thus hardly worth while going to the expense of improving it. In effect the entire tract of land would be lost to you. In deeds to real estate such blunders may be remediable, but in patents whatever is not claimed is lost to the inventor absolutely and can never be recovered. In deeds to real estate such a blunder is not likely to hap-

pen even once in a thousand years; in patents such blunders happen perhaps more than a thousand times every year. Indeed such blunders are so much in evidence that one is justified to believe that they must be happening, perhaps ten thousand times a year.

“All the courts strive to hold up every patent at bar. The judges well know the frailty of the human mind and its liability to err and make all the allowances they possibly can. But they also well know the law, and the upholding the law is their sworn duty. And so patent after patent is being impeached and invalidated because, many of the decisions read to the effect, while it is true the inventor had a generic invention and could have claimed it broadly, it is a settled principle of law, enacted by statute and announced by the courts, that a patentee and his assignee have no right to the exclusive use of anything patented which the inventor [his attorney, of course] has not distinctly claimed in his application for the patent. Or, as the judges in a certain Circuit-Court-of-Appeals case have said: ‘A person who discovers a new and useful invention does not obtain a monopoly under the patent laws unless he claims his invention in his patent. Even if he described his invention in the specification, and then claims as his invention something he has not invented, *his patent is good for nothing.*’ All the hurriedly-made patents are good-for-nothing patents.

“One inventor, a personal friend of mine, was collecting royalties at the rate of \$100 a day for nearly two years. A competitor of his firm discovered the weakness of the claims in his patent. I do not know the precise facts in the case, but I think his patent was one of those hurriedly made patents. The patent was impeached and declared null and void, because his attorney failed to claim the invention. My friend spent all the money he had made out of that invention in the hope of restoring

the validity of his patent, but the patent was repeatedly defeated and fell entirely. This is only one of thousands of similar cases.

"If that friend of mine, the dethroned successful inventor, or any impecunious inventor for that matter, were permitted to go into a vacated Government Mint Works and sweep together all the gold dust he could gather in seventeen weeks' time, you may rest assured that he would not lose one moment's time of those precious seventeen weeks. He would come prepared with all kinds of scrapers and sweepers and industriously work away with all his might, scraping off all the dried on dirt and sputum, and after cleaning out all the crevices he would probably erect shaky scaffolds and climb at the peril of his life or limb to sweep off all the spider webs from the walls and ceilings in the hope that some gold dust may be imbedded in the webs. Imagine how happy he would feel if the value of the gold dust he had thus painfully gathered during those seventeen weeks time amounted to \$527! And this same industrious man has, through his false sense of economy, lost an opportunity to gather about \$527,000 in seventeen years' time with no more effort than the landlord has in collecting his rents.

"The practical inventor is not hasty. He instructs his attorney to take all the time it may be needed to make the patent cover every feature and function of the invention. The preparation and prosecution of an application for a real practical, commercially-acceptable patent is a onerous task. When little or nothing is claimed, as in the case of the hurriedly made patents, the few specific claims presented, if in proper form and free from technical objections, are at once allowed. The examiner has nothing to do and is glad to dispose of the case with little or no labor. But when much is claimed, as a good

attorney always does, the examiner cites a number of references, some of which are wholly without pertinence and others have but little bearing on the case, and rejects most or all of the claims presented. To sift out all that is new in view of that mass of references in order to make the patent as broad as the invention cannot be done properly in one time, however skillful the attorney may be. It may take two or three revisions of the case, and after considerable study and labor suggest a new line of prosecution. And then some examiners are very slow and reserved in their deliberations, and it requires a lot of argumentation to convince them. In short, to make a real patent takes skill, time, and labor; to make a fool patent any botch of a patent attorney or a patent lawyer can do, and in a hurry, too.

"If you invent something that seems promising, have it patented right or not at all. The difference between the cost of a hastily made patent and the cost of a studiously made patent is, in simple cases, only \$5. But the difference in the quality between the two patents is often all there is between something and nothing. A habit of thriftiness is highly commendable. But where is the sense in saving \$5 and losing \$65 and all the hope of ever realizing on that invention?"

"Very well, then. Take your time and make the patent as good as you can. My next problem is, what am I going to do with my patent? I suppose I will have to wait until the patent is allowed and then advertise it for sale or put it in the hands of some reliable patent seller."

"We will discuss this subject some other time."

"Vigilance in watching opportunity, tact and daring in seizing upon opportunity, force and persistence in crowding opportunity to its utmost of possible achievements—these are the material virtues which must command success."—*A. Phelps.*

LESSON XIX.

How to Make Money Out of Patent Rights.

Two weeks later my nephew came up with a roll of drawings under his arm, and after some conversation with his sweetheart both came over to me and took seats at my desk. After a few minutes social chat, my nephew, in a delightfully cheerful mood, informed me:

"I have invented a mechanical motor which bids fair to revolutionize rowing. I have been working on this invention for six long nights in succession, and believe my mechanism is now simplified and elaborated to the highest degree possible."

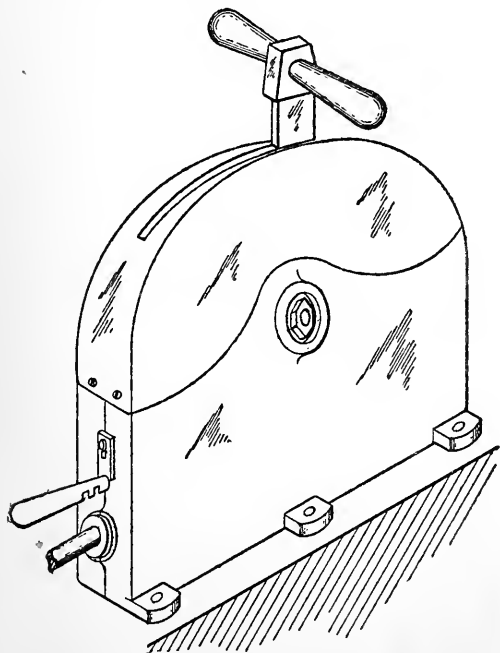
"How did you happen to invent a mechanical motor?" I asked him. One can often tell of the possibilities of a new creation by knowing the motives that prompted its invention.

"Why, Lillian [Miss Sharp] is responsible for the invention of this motor. We were down the river on Sunday before last. I was rowing her in a boat and she asked me: 'Do you know what kind of levers you are using?' I looked at the oars and saw that I was using a very foolish kind of levers. In using oars the power is applied to the shorter ends, with the result of a decrement instead of an increment in power. No wonder one tires

so quickly. When we returned home both of us made drastic attempts to reverse the leverage of the oars by means of gears, knee joints, toggle-jointed links, etc., but every attempt proved abortive. Lillian abandoned the project entirely, concluding that our object was unattainable, but I could not throw it off my mind. And so after two days rumination I have invented a mechanical motor that will dispense with the oars entirely."

"But where is the advantage of having a mechanical motor when one can equip a rowboat with a gasolene engine?"

"Rowing is indulged in for two purposes: First, for the outdoor exercise of the muscles in the arms and in



the upper part of the body rowing affords; and, second, for the pleasure of gliding on the water. The power-driven boat deprives the users of the benefit of the exer-

cise afforded by working the oars, and the oar-driven boat deprives the users of the pleasure of gliding swiftly along the stream and covering a longer distance. My mechanical motor accomplishes the good features of both the oar and the power driven boats. Furthermore, it is simpler in construction and much cheaper to manufacture. It occupies less room in the boat and is always ready for use. It is provided with means for reversing the movement of the propellor shaft without stopping the movement of the two fly wheels, and the mechanism is encased impervious to the ingress of water. Look at this sketch, showing its exterior (see page 163).

"Lillian, too, is working on a basting attachment to a sewing machine which seems quite practical, but she is not quite through with it. Well, we are strongly determined to make our fortune by inventing and will peg away until we will get there. We have learned all about the inventing and the importance of the patent. We will bend all our energies to see that our inventions stand on all the four legs, and on as sound legs as it will be in our power to make them. You will of course make the patent on this invention as good as it can be made. But what are we going to do with the patents after we get them? Can you give us the names and addresses of some reliable patent brokers, or would it be better for us to advertise the patents for sale; and if so, can you give us some idea as to how we should advertise them? Please, uncle, tell us all we ought to know about the business end of the patent. With a fair knowledge of the business end of the patent, I believe we will be in a position to take good care of ourselves without troubling you further, except on business."

I was delighted to hear that they have formed such determination, and exceedingly glad that I have been

instrumental in awakening their ambition and put them in a position to materialize it. After commending and praising their course, and enjoining them not to swerve therefrom under any circumstances, I said: "With the knowledge of the requirements of a commercially valuable invention you now have, if your determination to make your fortune by inventing is invincible, your fortune is as good as made. The most essential part in the endeavor to attain financial success by inventing, is to keep the objective point—financial success—always in view. The shoemaker knows that in order to command \$10 for a pair of shoes he must first procure first-class leather, next, make the shoes fit perfectly, and finally, finish and polish them up so that the customer can see at a glance that enough pains have been taken with them to be worth the price. Many inventors lose sight of the objective point, and others miss one or more steps leading thereto."

"It is not always possible to make a fortune out of a single invention. But with your eyes open for opportunity to create something that the people need or want, inventions will come in frequent succession.

"Force and persistence in crowding opportunity to its utmost of possible achievement is one of the most important steps leading to the objective point—financial success by inventing. You have designed your mechanical motor with especial regard to its application to a row-boat, and therefore you have the motive shaft disposed horizontally and close to the bottom. But by a mere change this motor can be adapted to a great many different uses—and that means multiplying its financial possibilities—where transient power within its capacity is needed. Of course, I will draw the specifications and claims so as to cover all the uses of which its principles are capable, and the different uses therefor will suggest

themselves to you later. I am only telling you that your motor is capable of far greater financial possibilities than you had dreamed of, and that the inventor should bear in mind that almost every invention is capable of other uses and not allow his attorney to limit it to the particular use to which he adapted it.

"As to what you should do with this particular invention will depend largely on the kind of patent I will be able to get thereon. But to finish the course of instructions I have undertaken to give you, I will give you a few general and specific instructions and advice which will furnish you a guide in all your future cases.

"The profitable disposition of the property right vested in the patent is a most perplexing problem, but not more so than the profitable disposition of the property right vested in the deed to realty. If you had a deed to a 5 by 5 feet lot, situated in some out of the way suburb, you know very well that no real estate agent on earth could sell it for you, and that no amount of advertising would sell it for you. But if you had a 50 by 100 feet lot in the center of the city, you know very well that all you would have to do is to find the right party who wants that particular lot and is willing to pay for it what you think it is worth.

"There are countless patents held by inventors which cover no more valuable property right than the 5 by 5 foot lot of our example. Metaphorically speaking, the claims in those patents read something like this: 'In a steam engine, which comprises a steam cylinder, a piston, a crank shaft, a connecting rod, and a fly wheel; I provide a hook for the engineer to hang his dinner pail on.' The inventor actually invented the entire engine illustrated by the drawings in his patent, and he stuck in that hook merely as a slight convenience which may or may not be used. But the engine was entirely anticipated by

prior patents and all there was new in view of the state of the art is that hook—a worthless trifle. The inventor saved the \$5 fee charged by other attorneys for the preliminary examination and in consequence does not know that his engine [or whatever the invention similarly claimed is] is anticipated by prior patents and still thinks he has a patent on the steam engine shown and described in his patent.

“Such patents as these called into existence a number of I-SELL-PATENTS men who thrive upon such victims. These patent sellers know very well that such patents are unsalable. But they also know very well that every one of these patentees is mighty anxious to sell his patent and that some innocent looking sophistical literature, supplemented by a circular letter containing one or two plausible arguments, and followed up by a circular letter and a book full of testimonials from satisfied clients will make the improvident patentee squeeze out one or two ten-dollar bills from his already depleted exchequer.

“If there are any honest, able, and earnest patent salesmen, either in this country or in any other country, I was never fortunate enough to learn of their whereabouts. There are reliable business men who often act as promoters, but they will not touch a patent proposition of limited financial possibilities. In the absence of a reliable factor, the burden of the business end of the patent rests entirely upon the inventor’s shoulders and he himself must learn all he can of the causes of failure of his unfortunate contemporaries in order to know how to avoid them.

“A fairly promising invention covered by a well made patent can readily be converted into cash or into a royalty income, and it does not take a professional patent salesman or a shrewd financier to do it. Any person of or-

dinary intelligence can do it. If you have an undesirable invention or a desirable invention and no adequate patent to claim ownership with, no salesman on earth can dispose of it legitimately.

"Many inventors overestimate the value of their inventions, and as a result some of them have refused reasonable offers for their patent rights which they have never been able to duplicate, and the patents may remain unsold until they expire. Other inventors have named for their patents such monstrous figures that they could not be considered at all and thus lost their most brilliant, in many instances their only, opportunities to cash their inventions.

"As an example of the lofty notions of the young inventor, an inventor filed an application for a patent on a certain article without having a preliminary examination made. He was sure nobody could have thought of such a scheme and refused to pay the fee for a preliminary examination. Later he asked me to give him some idea as to what I thought his invention is worth and where he could dispose of his patent right after the patent is issued. A reference was cited against the case and I had discovered in a trade journal that the article shown in the reference is being manufactured and marketed by the patentee. The nature of the thing showed very plainly that if there is a demand for any such an article at all it must necessarily be very limited. My client's drawings showed that his invention contained certain patentable features over the reference and possessed considerable advantage over the construction shown in the reference. But the latter being the only and recent patent, the claims in that patent would prevent my client from manufacturing his improved article and no sane business man would buy such a patent.

"I could not of course give my client the slightest idea as to how much his invention is worth. But with the copy of the reference on record I sent him, I wrote to the effect that as this is a recent patent he will have to sell his invention to the prior patentee, and that in view of this fact he cannot expect much for it. I told my client that he need not wait until the patent is issued and advised him to submit to the patentee the blueprint of the official drawings I sent him and find out how much that party is willing to pay for the improvement.

"Two weeks later I received a letter from my client stating that that foolish patentee flatly refused to consider his very liberal offer of accepting \$10,000 cash for his invention, and asked whether I do not happen to know of some other party who would buy it for that reasonable figure. Had he asked \$400 or \$500, which, in view of the anticipation, is all the thing was worth, the patentee might have bought it either because it contained some marked improvement or to avoid fighting an infringer.

"The inventor must consider the standing of the party he is negotiating with and never for a moment forget the extent of the monopoly and the financial possibilities of the invention he is offering to his correspondent. If that client of mine possessed some business tact he would have known that a patentee starting out to manufacture an article of his own invention for which the demand is yet to be made, and an article for which the demand will never be great, is not likely to have \$10,000 to invest in an improvement thereon. But in order to enhance the quality of that article, and through this perhaps increase the demand therefor, he might be willing to do some things within reason. If the transaction had been properly handled, that patentee could probably have been made to pay \$200 or \$300 cash and a small royalty

upon every article he would make during the life of the new patent. If the article should happen to come into more extensive use, as the inventor expected it will, that small royalty might have amounted to a great deal, perhaps come up to the \$10,000 mark, and perhaps to more than \$10,000. No one can foretell the extent of the demand for a new article, even though there is none at the present.

"Patent soliciting companies who publish, or are interested in the publication of, magazines, insist that the only way to dispose of a patent profitably is to advertise it in their publications. The greatest blunder an inventor can make is to advertise his patent for sale in any publication, and the larger the display of the ad and greater the circulation of the publication the greater are the chances of never selling that patent. It is true that once in a long while one does sell a patent by means of advertising; and a worthless patent, too. But cases of such sales are so rare nowadays that they deserve no notice. Improvident inventors are legion, improvident patent buyers are very scarce nowadays. They learned to know better.

"The greater number of the inventions patented are simple improvements on things already in use ranging in value from several hundred to several thousand dollars. The best time to dispose of such improvements is before the patent goes to issue. But before proceeding with the disposition ascertain from the patent attorney handling your case what the chances are for getting tolerably broad claims in order to know how much to ask for your invention. Don't insist upon a positive assurance for he cannot give it to you for any price.

"The law requires the examiner to cite the best references with his first action on the merits of the case.

But it oftens happens that he does not discover a fatal reference until the next action. It is therefore better to wait until the case has been acted on twice. If after the second official action the attorney's opinion is favorable, the inventor may proceed with the business end of his invention without waiting for the issue of the patent. The possibility of interference or further references are remote and therefore need not be considered.

"Competition is very active in every line of industry, and the manufacturer who buys a patent does so either to improve the quality of his product by incorporating certain features of the improvement it enunciates, and thereby be in a position to defy competition by means of superior quality or to prevent the patent from falling into the hands of his competitors and thus keep out keener competition.

"Every manufacturer thinks his product is as good as it can be made and has a lively disdain for improvements made by anyone but his own factory experts. Experience shows that outsiders make the best improvements, and the manufacturer knows it. Still, it seems very hard for a manufacturer to bring himself to take seriously an announced improvement upon his product by an outsider. His natural tendency seems to be to shut his eyes and stop up his ears so that he won't see nor hear of anything better than his own product.

"This may seem strange to you, but put yourself in his position and you will readily see how natural it is for a manufacturer to make himself believe that nothing better than his own product is possible. Suppose you were, say, a cyclometer manufacturer and have spent a year's time and \$10,000 on perfecting your cyclometer and making the tools, dies, and jigs for its manufacture. Of course you were convinced that you have the best cyclometer in the world before you went to this expense

of time and money. If a few years later you saw a patent on a cyclometer advertised which the inventor claims is a great improvement over the old style. Now an appreciably improved cyclometer must necessarily be a reorganized cyclometer, and a reorganized cyclometer means a brand new cyclometer, and a brand new cyclometer means throw away the tools, dies, and jigs of the old cyclometer and spend another year's time and \$10,000 cash to make new ones. Wouldn't it be natural for you to say, 'Oh, nonsense! That inventor dreams he has a better cyclometer than mine. What does he know about cyclometers?' and ignore it entirely.

"Still, manufacturers do buy patents; as I said before, either to incorporate certain features of the improvement or to suppress the improvement. But my experience has taught me that the only way to tempt a manufacturer to invest in a patent is to make him believe that he is the first and only human being who has ever seen or heard anything about the new improvement. It is obvious that advertising the patent in any publication will not accomplish this. Whether you had a reply to your advertisement or not, the manufacturer will take it for granted that as the patent is advertised every Tom, Dick, and Harry knows about your invention and will not give it a single thought. But you send the manufacturer a blue-print of your official drawings accompanied by a plain business letter, in which you point out the novel features of your invention and briefly mention the advantages of your improvement and you have him very much interested. Your personal letter is a business communication and the manufacturer cannot help reading it, and he cannot help looking at the blue-prints. If the invention is really interesting to him he cannot help being interested in your presentation and take your proposition under consideration. If you should send a blue-print and a per-

sonal letter [not a printed circular] to each of a hundred of manufacturers of the article you improved upon, every one of the hundred of manufacturers would think that he is the first and only one in his line of manufacture who knows the secret that an improvement of the kind shown in your blue-print is being patented."

"But as the patent is not yet issued what will prevent the recipient of the blue-print from making some improvement on my improvement and apply for a patent?"

"Nothing can prevent him from making an improvement on your improvement and applying for a patent thereon either before or after your patent is issued. But if your blue-print should suggest some improvement to him, so much the better. Because any improvement on your improvement, unless it happens to be a broad departure from your principles, would make him tributary to you and therefore more anxious to obtain control of your invention while he has it under consideration and thus in his power to acquire it."

"How about an interference? Wouldn't my correspondent be likely to file an application for a patent on the device of my invention and fraudulently prove priority rather than to pay me the price I may ask for it?"

"Bosh, nothing of the kind has ever happened nor likely to happen. Don't be apprehensive on this score. The young inventor is shy and distrustful. I do not deny the fact that fraudulent interferences do happen, but only once in a very great while, and when they do happen they are generally due to some peculiar circumstance in which there is some honest reason for the interferer to believe himself to be the prior inventor. As a rule all of the interference cases are honest contests. It would take a most depraved reprobate of a manufacturer to abuse the trust and confidence reposed in him by an inventor, and such rascals do not exist among responsible

manufacturers. Never give this possibility a single thought. Furthermore, nothing can prevent one from putting you in an interference after the patent is issued. In either case the onus probandi, or the burden of proving priority, would rest upon your opponent and in almost every instance the fraudulent opponent fails to prove priority. Perjured witnesses will betray themselves under skillful cross examination, and the Examiner of Interferences with his staff have had enough experience to descry false testimony.

“Have no fear of any evil consequences resulting from your submitting a blue-print of your invention to a responsible manufacturer before the patent is issued. It is perfectly safe, and my experience taught me that this is the only practical way to interest a manufacturer and close a deal.

“As I said before, every manufacturer thinks his product is as good as it can be made, and some of the ever-busy will not even take the time to read a long letter describing an improvement on his product. Make your letter therefore as brief as possible. Above all things refrain from praising your invention or rakishly show the amount of money it is likely to yield. Still better, beyond briefly pointing out the construction and operation or application of your invention say little or nothing of its advantages. There is nothing you can tell the manufacturer about the article he manufactures or your improvement thereon that he does not know. If an actual demonstration is deemed expedient and a model can be made at small expense, have a model made and send it with the blue-print if mailable, if not state in your letter that you have a model and will be glad to send it upon request.

“Write your letter accompanying the blue-prints or model so as to make it appear that you do not know

yourself what a good thing you have in your invention. Excessive enthusiasm forces the manufacturer to take an opposite view, and if he happens to be irritated at the time he receives your missive he may throw your frenzied letter with the blue-print into the waste basket before he had examined your blue-print and was half through with the reading of the letter.

“Refrain from practicing tricks on your correspondent. If you offer the patent for sale do not ask the manufacturer whether he is in a position to manufacture your invention for you in order to make him believe that if he does not buy it he will have a powerful competitor to deal with. It will not make him believe that, but will make him disbelieve everything else your letter may state, and as a result throw your letter into the waste basket or answer that he is too busy with filling orders for his own product to consider your invention.

“But not all improvements will interest the manufacturers of the products improved upon. You must therefore first settle the question as to whether or not your invention is of such a nature as to interest the manufacturer before you submit the blue-print to him. Take, for example, the adjustable culinary utensil support as improved by you. This improvement is not likely to interest the gas or gasolene stove manufacturers, because it cannot be incorporated in the stove without more or less impairing its appearance, and a manufacturer will in no wise impair the external appearance of his product. The purchaser is first attracted by the appearance of the article, and anything that encumbers its appearance will interfere with the much sought after first impression. Give your inventions all the elegance of appearance you can. Many appreciable improvements fall short of this mark and in consequence fail to interest manufacturers.

"Miss Sharp's adjustable culinary utensil support, as improved by you, consists of a small piece of stove pipe which with the screw threads impressed and a neat little knob could be manufactured in large quantities for about three cents each and would readily sell at twenty-five cents each. Yet this invention would not interest stove pipe manufacturers, as such, because something must be done to the stove before the support can become available for use, and this is beyond the sphere of their industrial activity. The stove pipe manufacturers can make the supports but not fit them to the stoves.

"The best plan for Miss Sharp [and inventors having inventions of similar nature] to adopt would thus be to have the adjustable culinary utensil supports manufactured and market them herself, with or without the assistance of a partner. The marketing can be effected either through house-to-house canvassers or through household good stores, introduced to the housekeepers by public demonstrations in store windows or inside displays. House-to-house canvassers would themselves make the necessary shear cut and fit the adjustable utensil support to the stove, and the household goods dealers would have their delivery wagon drivers do it. In either case she would have to give about 50 per cent of the sale price of the support. But there is still 300 per cent profit on the investment, and if the sales were energetically pushed through agents or canvassers the non-competitive enterprise could be made to yield a little fortune.

"The tripot utensil support, again, could be sold through the regular channels of trade and therefore might interest a hardware specialty manufacturer. And while it might cost somewhat more to manufacture, the fact that its sale could be forced through the regular channels of trade might offset the additional cost.

"A thoroughly reorganized lock, such as the Yale lock, for instance, is a broad departure from the former styles of locks. Such a lock invention could command a royalty from a lock manufacturer. But a mere change in the shape of the latch and its keeper, such as the latch lock of your invention, for instance [or an invention of similar import], would have to be sold to a lock manufacturer outright. No lock manufacturer with an established trade for his latch locks would agree to pay a royalty on such an improvement. Before submitting the blue-print of an improvement of such character [or of any invention that has to be sold outright], find out about how many latch locks are manufactured annually in the United States. This can be accomplished by making inquiry of the trade journal publication—in the present instance through a friendly hardware dealer who is a subscriber to the lock trade journal. If your invention enhances the jobbing price of the lock about 5 cents, figure on the basis of one cent on each lock for the entire output of latch locks in one year and let this be the figure you will offer your patent right for. If the output is, say, 100,000 latch locks a year, the most you can reasonably ask for your invention would be \$1,000. It is true your patent is good for seventeen years and is worth \$1,000 a year. But the lock manufacturer who wants to buy your patent does not manufacture all the 100,000 locks every year.

"Every purchaser of a patent right is a pessimist. He thinks, and believes, and guesses, and dreams of possibilities the inventor could never conceive. Before one decides to buy a patent right he thinks it may not be a success, he believes that if the invention does become popular it will only be for a year or so; he guesses that within a year or so someone will invent something better; he dreams that he will have to fight infringers or will be sued for infringement by some other assignee, etc. In

short, the purchaser of a patent right sees reasons why he should not pay more than a small sum for the patent that the inventor could not see with the aid of the most powerful magnifying glass. And therefore, my dear children, never be tempted to ask a big price for a small improvement, because you simply won't get it. Your negotiant will answer you by return mail that he is not interested in your invention, or that he is too busy with other matters to take your offer under consideration, or he may become incensed and not answer at all. Ask a reasonable price from the beginning—never, of course, in the first letter nor in a subsequent letter; wait until you are asked to name a price—and save yourselves the mortification of losing a brilliant opportunity to sell your invention.

“An invention such as the log-sawing machine of our example, can be placed on a royalty with some responsible saw-mill or woodworking-machinery manufacturer. Royalties, generally speaking, range from 5 per cent to $12\frac{1}{2}$ per cent of the sale price of the machine or article. A royalty of only 5 per cent on an extensively used article, such as the two-piece glove button, for instance, means an immense fortune for the inventor. A royalty of 5 per cent on a thing of limited use would not be enough. As a general rule, figure out the approximate gross net profits and demand about one-fourth thereof, but for convenience of apportioning the one-fourth make it come out of the sale price of the article. On a machine such as the log-sawing machine of our example, as you have seen when we figured out its financial possibilities before going to the trouble of inventing it, a royalty of 10 per cent is all the inventor can reasonably ask. In short, bear in mind that whenever you ask more than the manufacturer can afford to pay you ruin your chances of closing a deal—less you are not likely to ask.

“The inventor of an improved article, a smoking pipe, for instance, has but two ways of disposing of his invention. He can sell his patent right to a pipe manufacturer outright or grant him an exclusive license for manufacturing the patented pipe for a stipulated license fee, or royalty. He may, of course, be in a position to manufacture and market his improved pipe himself, with or without the aid of a partner. But if he is not in a position to make and market his improved article himself, he has but the aforementioned two ways open to him to dispose of his patent right. The inventor of an improved machine for the manufacture of an article of extensive use, say smoking pipes, the improvement of which consists in being capable of producing an appreciably greater number of smoking pipes in a given period of time, say as much more as the best machine of its kind, has three more ways of adequately realizing on his acquired property right.

“There are, say, fifty different styles of smoking pipes on the market. The improved pipe making machine as shown in the drawings of the patent covering the same is adapted to but one style of pipe. But a properly made patent secures to the inventor the exclusive right to adapt his machine to the manufacture of any and all the styles of pipes that are now in use or that may come into use any time during the life of the patent. It would therefore be the height of folly for an inventor, or patentee, possessed of such a patent right to grant a pipe manufacturer the exclusive right to make and use the patented machine for a stipulated license fee, or royalty, as he would thereby limit the usefulness of his machine to the single style of pipes manufactured by his licensee.

“An inventor possessed of such a machine and patent right could join forces with a machine manufacturer and manufacture pipe making machines for all the kinds and

styles of pipes to which the principles of his invention can be adapted and either sell the machines to pipe manufacturers outright or lease them for a license fee of a stipulated sum of each gross of pipes made on the patented machine.

“Another plan for adequately realizing on such an invention is granting a shop license to each of the pipe manufacturers, authorizing him to make and use machines for the lines or styles of pipes he manufactures. These rights can either be sold outright or on a royalty. The shop-license plan is not always feasible. Whether or not it would be feasible in an invention of the nature of our present example, depends largely upon the construction of the machine and the cost of reproducing it in small lots.

“Still another, and the most feasible, way for adequately realizing on an invention of the nature of the pipe making machine of our example, is to organize a stock company to build machines and manufacture several of the most popular styles of pipes on the patented machine. The remaining lines or styles of pipes may be disposed of as indicated or, if deemed more feasible, as it is often the case, entirely suppressed by that company.

“When the patent is sold outright the assignment will be prepared by the purchaser of the patent, and whether he employs an attorney to draw up the assignment or not the inventor has nothing to worry about. All he has to do is to see that he gets his money immediately after he affixed his signature to the assignment. But when a royalty contract is to be made the contract should be made by the inventor and drawn by his attorney. There are two important provisions to be inserted in a royalty contract which thoughtless inventors often omit and disastrous results inevitably follow. The first of these provisions is that the manufacturer must make and sell,

or account for, not less than so many articles every year; and the second is that if he fails to pay royalties as they fall due, or to account for the minimum number of articles specified the inventor reserves the right to terminate the license granted to him by this contract and grant it to another manufacturer.

“Every manufacturer will object to these two provisions. He will say that he is honest, progressive, and reliable and that he will do his utmost to make and sell as great a number of your patented articles as possible, etc. But it will be like committing financial suicide for you to omit either of these two provisions. Never sign a royalty contract made out by the manufacturer or by his attorney nor copy one from a book, but employ a reliable attorney to draw up the contract or license, and if the manufacturer objects to the two provisions named, let the attorney argue it out with him. A clear-headed attorney will bring him around alright, unless he lacks confidence in the invention or means to suppress it. In either case that manufacturer is not the right party to deal with. Drop him and look for another.

“An invention that is to be sold outright should be first offered to the smaller manufacturers in its line. If it is something he wants and the price is within his reach the smaller manufacturer will pay a better price than the larger one. An invention that is to be placed on a royalty should be offered first to the largest manufacturer. The larger the manufacturer the harder it is to deal with him. But it is better to accept a royalty of 5 per cent from a manufacturer that has a factory capacity of five hundred articles a day than a royalty of 10 per cent from a manufacturer that has a factory capacity of only one hundred articles a day. But whether the manufacturer is large or small, it would be the height of folly, indeed, sheer idiocy, to omit the aforementioned two provisions.

"If a stock company is to be organized for the commercial development of your invention you must have everything ready before you start out in quest of the principal investors and directors. It is not possible to persuade capitalists to invest large sums of money and their valuable time to direct the affairs of the new company unless you can show them that the chances of realizing on their investments are much greater than the chances of losing a single dollar. Unless you are prepared to prove this beyond a reasonable doubt in five minutes' time, you are not in a position to do business. You will find scores of business brokers, financial brokers, and professional promoters who at a glance at your blue-print will assure you that the easiest way for you to make a large fortune from your invention is to form a corporation with yourself as president, your wife as vice-president and your son or daughter as secretary and sell stock. And for the mere privilege of selling your stock these schemers will offer to contribute one-half of the cost of the incorporation. But beyond relieving you of one or two hundred dollars nothing else will happen.

"To be prepared to approach a capitalist you must have first a patent of proper stamina officially allowed; second, a working model of the patented machine, and third, a prospectus so skillfully written [typewritten, not printed] that a glance at the first page will excite the capitalist's cupidity. The prospectus must show clearly, concisely, and truthfully, by means of facts and figures, the financial possibilities of your proposition. If the financial possibilities are sufficiently tempting, the capitalist approached will associate with himself two or more able business men, an attorney, and one or two experts and proceed with the investigation of the patent and the working model. If satisfactory and the terms between you and them settled, the incorporation will begin and

you will assign your patent to the new corporation for a block of the stock, stock and a bonus, or stock and a royalty as your lawyer or attorney may see fit to advise you and you to accept.

"There may be certain exceptions, but as a rule a cogent prospectus is as essential as a good patent and a good working model. There are men in every large city who make it their business to prepare such prospectuses. They gather all the necessary data relative to consumption, cost to manufacture, etc., and show the capitalist by facts and figures in the prospectus how much money he can make out of your invention.

"With the patent allowed, the working model finished, and the prospectus on hand, put two or three copies of the prospectus in your pocket, go to the nearest large city and visit a few of the largest real estate offices. Ask the real estate man to give you the name and address of a party who is seeking profitable investment for \$25,000 or \$50,000, according to the amount the starting of the manufacture of your invention may require. Real estate men usually know of such parties, but they are not in the business to tell. Before the real estate man has a chance to say that he does not know hand him a copy of your prospectus and tell him something to this effect: 'This is a great opportunity for a man with capital and business ability to double or triple his investment every year during the life of my patent, and if you will take a few moments' time to read through this prospectus you may yourself become financially interested.'

"Now, a real estate man will not invest his money in an industrial proposition, but this indirect invitation and the cursory reading of one or two pages of the prospectus, if you look at him intently and expectantly, will usually prompt him to utter: 'I think this proposition would interest Mr. Lewis.' If you should ask him who

that Mr. Lewis is, what is his first name and address, what is his business, etc., he would most likely tell you that he does not know, because he breathed the name unconsciously or thoughtlessly, and that would end your interview with him. It is therefore better to ask him: 'I suppose you are intimately acquainted with Mr. Lewis and know he is capable of handling such an enterprise to advantage. I cannot afford to go in with a man destitute of executive ability no matter how much money he may have.' And he will very likely answer: 'Oh, yes, Mr. Lewis is capable of handling such an enterprise, alright. He is a very shrewd business man. He had made his money in a patent elevator,' etc. Next tackle him for a letter of introduction to Mr. Lewis. Whether he is intimately acquainted with Mr. Lewis or not, a letter of introduction from a local business man would help you to approach Mr. Lewis with greater confidence and be received by him more considerately.

"If after you have made the rounds of the real estate offices you fail to procure the names and addresses of men looking for profitable enterprises, try a few of the insurance-and-loan offices and a few lawyers. If everything else fails, advertise in one or two of the most appropriate newspapers.

"The fact that so many thousands of the hastily made patentless and inventionless patents are constantly advertised, and that thousands of investors have swamped their fortunes in such patent propositions, the most businesslike and earnest advertisement of a patent proposition fails to excite interest in persons looking for a profitable enterprise. In many it excites disgust. The advertiser of a patent for sale or for a partner with capital to develop an invention gets a lot of answers, but only from fake promoters, cunning patent attorneys and patent lawyers who urge the advertiser to apply for foreign patents, and

from the countless parasites who prey upon the guilelessness of inventors.

"In view of these facts it is inadvisable to mention in your advertisement that what you have is a patent proposition. Then there are those who write for particulars to every advertiser in the hope of somehow getting some money out of somebody's pocket. To avoid all these parasites and to expedite matters it is therefore better to advertise something to this effect: 'A non-resident with a highly profitable enterprise wishes to interview an able business man having \$50,000 cash at his disposal with a view to securing his active co-operation.' Of course your enterprise is not yet profitable. It promises to be profitable. But the word 'profitable' in place of 'promising' will prevent the vampirical promoters and incorporators from inviting you to interview them and at the same time make the party you are looking for believe that you have a 'going enterprise.' There is no harm in this insinuation. The aim and object of this substitution is merely to afford you an opportunity to show your prospectus to the right party. Business men are used to such little tricks. At the interview you apologize for the substitution and explain why you did so word your advertisement.

"A letter of introduction from a local business man is very desirable. But men of \$25,000 or \$50,000 capital are not very difficult to approach without either a letter of introduction or an answer to an advertisement. Do not leave the city until you have interviewed three or four prospective investors and left the three prospectuses with them. If the party interviewed is not interested he will return the prospectus you gave him to read and tell you that he is not in a position just now to interest himself in your enterprise. If the party interviewed is in-

terested he will ask you to leave the prospectus with him and tell you that he will communicate with you.

“So soon as any one of the parties you have interviewed has investigated your patent and working model and asks for terms, entrust the negotiation to a reliable lawyer or patent attorney ; co-operate with him and let him carry on the negotiation and close the deal. There are many bombastic lawyers and pretentious patent lawyers who know no more about such business than you do. But there are some that can handle the negotiation to great advantage to you. So be careful in the selection of your man.”

"The most successful knaves are as smooth as razors dipped in oil, and as sharp."—*Colton*.

LESSON XX.

Assignments and Contracts.

Having told them what I thought was all they needed to know, I rose from my seat to go home. My nephew detained me with a convulsive "One moment, uncle, please." I resumed my seat and he began somewhat hesitatingly, as if prescient of a dissuasion.

"As you know I am pretty hard up just now and \$100 cash means a great deal to me. I happened to speak to my landlord, Mr. Grab, about my mechanical motor and showed him that even to sell the patent outright it ought to bring at least \$10,000 cash. Mr. Grab went over my figures very carefully, then congratulated me warmly and heartily, wished me success, and finally he said: 'You have been out of work for several weeks and no doubt need some money. I will be glad to help you out some if you are not vain enough to refuse it. I don't believe your mechanical motor is worth quite as much as you say, but you have been my tenant for several years and so I am willing to give you \$100 cash for a one-hundredth part interest in your patent, which is all it is worth according to your own calculations; provided, of course, your invention is as broadly new as you think it is.'

"I was very much surprised at his generosity, as Mr. Grab is a very tight-fisted man. Of course \$100 is all one-hundredth part interest in my mechanical motor is worth, and Mr. Grab to pay full value was quite a surprise to me.

I was anxious to close the deal on the spot but did not want him to know that I was so hard up, and so I told him with an air of indifference that I will think it over and let him know tonight. There is no reason why I should not accept his offer, is there? I don't see what that old fool could do with that one-hundredth part interest in my patent."

"Indeed, there is a very good reason why you should not accept his offer. As to what that old fool could do with that one-hundredth part interest in your patent. Well, Mr. Grab knows his business all right. He could grant licenses to every rowboat manufacturer in the country. He could manufacture your motor and supply the markets with all they can use. He could make all the money there is in your invention in every way he pleases. He is legally entitled to make all the money your patent is capable of yielding. He does not have to account to you nor share with you. If you should find a purchaser offering you \$10,000 cash for your invention, Mr. Grab could say that his one-hundredth part interest in your patent is worth to him \$25,000 and refuse to surrender his assignment. In other words, by assigning even so small an interest as a one-hundredth part of your patent you will lose control of your patent right and your assignee will acquire all the rights and privileges as if he owned the entire patent, except the right of granting an exclusive license which neither of you would then have, and thus freeze you out of your property right entirely.

"Never assign an interest in your patent.

"If you are in urgent need of money, sell an interest in the proceeds resulting from the disposition or exploitation of your patent right, not an interest in the patent. And try to sell such an interest to a Mr. Grab or any voracious money shark. The more greedy the

purchaser of an interest in the proceeds of your patent is, the better for you. He will make the money out of your patent if you cannot. Of course you cannot expect a purchaser of an interest in the proceeds of a patent right to pay you all it is worth. If your patent right is conservatively estimated to be worth \$10,000, you may ask \$500 for a one-fourth interest in the proceeds resulting from the disposition of your patent right and accept \$300 if your negotiant refuses to pay more.

"Never sign a contract or memorandum or note containing some allusion to your patent without having the same carefully read by a lawyer or patent attorney. Many unhappy inventors got themselves unwittingly into trouble. To demonstrate how easily a thoughtless inventor can get himself into trouble, a guileless countryman sent by his little girl a simple little note to his grocery man, written on a piece of manila paper with a pencil and worded something like this:

"Dear Mr. Sam Smith—I am in urgent need of some money, and so for the loan of \$25 I will give you one-fourth interest in my patent on a wagon jack which was printed on January 10, 1910. Give the check to my little girl, and please be sure to wrap it up in a large sheet of paper or large envelope so she won't lose it. Also give her a bag of salt, a pound of sugar and a can of baked beans. My wife will pay for these things on Saturday. And don't you know, Mr. Smith, my horse broke a leg, my cow broke a horn, my pig broke his pen [and whatever other interesting news he may have communicated in that missive].

"*Yours truly,*
"JOHN JONES."

"A very innocent looking note, isn't it? It contains no serial number of the patent, none of the customary whereases, nor the apparently essential clauses of 'I, the said John Jones, have sold, assigned, and transferred, and by these presents do sell, assign, and transfer unto the said

Sam Smith, the undivided one-fourth part of the whole right, title, and interest in and to the said invention,' etc. Still, it is a valid assignment of—or rather a valid obligation to assign—a one-fourth interest in John Jones' patent on wagon jack for a valuable consideration.

"A few weeks later John Jones called on Sam Smith and returned the loan of \$25 with due expressions of gratitude for the accommodation, and good-naturedly remarked that he was only 'kidden,' as he would not take \$2,500 for a one-fourth interest in his patent. Sam Smith pretended to be busy at the time and made no answer. Jones, of course, thought or knew it was all right, or perhaps neither thought nor knew. He did know that he was 'kidden.' A few months later a certain party agreed to pay Jones \$10,000 for his patent. Jones was anxiously awaiting the cash, but instead he received a letter from that party accusing him of concealing the fact that he had already sold a one-fourth interest in his patent, and concluded: 'Since the one-fourth interest was sold for such a small consideration, the whole patent must be worth little or nothing.'

"You see, a business man has no such keen sense of humor as some of the young or improvident inventors. Sam Smith sent Jones' note to a patent attorney and the latter had the first sentence on that manila-paper note duly recorded in the Patent Office. Any instrument in writing, no matter how it is worded or whatever else it contains, if it contains a clause which technically amounts to an assignment, a grant, a mortgage, a lien, an incumbrance, a license, or anything which affects the title of the patent or the invention to which it relates, and is sufficiently clear to identify the same, can be recorded in the Patent Office; and Jones' note affected the title of his patent.

“If you assign an interest in the proceeds resulting from the disposition of your patent, if the instrument is properly drawn, the purchaser becomes a partner to the profits, not to the patent. Of course he can, and should, have your signature attested by witnesses and certified to by a notary public, but he cannot have it recorded in the Patent Office. Not being recorded in the libers in the Patent Office, the investigator will never know about that transaction and the purchase price of that interest. If the purchaser of the interest in the proceeds of your patent should insist, and he always will insist, you may secure his interest by a mortgage on the patent for, say, three times the amount he paid for that interest. He will have the mortgage recorded in the Patent Office. But a mortgage on a patent, like a mortgage on real estate, does not depreciate the value of your patent nor in any way interfere with the disposition of the patent. Before the purchaser of your patent will pay the money he will demand that the mortgage be formally released.

“Patents are often mortgaged the same as any other property right; that is, the mortgage simply secures the payment of a loan on notes bearing interest.”

"He knows the compass, sail, and oar
Or never launches from the shore;
Before he builds computes the cost,
And in no proud pursuit is lost."

—Gay.

LESSON XXI.

How to Build Working Models Economically.

"One more topic, uncle, please, and then we will be in a position to go out and shift for ourselves. I have heard at one time the term 'working model' applied to a miniature representation of a machine and at another to a full size working machine. Please tell us something about the working model, and particularly what are we to do when the cost of the working model is much greater than what we can afford."

"Simple things such as the adjustable cooking utensil support, the latch lock, or the thousands of simple things patented annually, can be disposed of without a model. The construction and operation of such things can be seen from the blue-prints as clearly as if one held the thing in his hands. But inventions enunciating new and unknown principles, or containing mechanisms of intricate construction, or are designed to perform problematical functions, cannot be disposed of profitably without a practical demonstration.

"The production of a working model is a costly and most perplexing undertaking. Thousands of inventors have lost some highly promising inventions because of their inability to meet the cost of a working model, and thousands of others have sunk small fortunes in experi-

mental work and unnecessarily lost both the money and the invention by being unable to carry out the model.

"Lack of knowledge is at the bottom of every loss.

"With a little intelligent effort any inventor who knows he has a promising invention and that the same is covered by sufficient claims to hold on to it can readily procure the co-operation of a friend, neighbor, or acquaintance to advance the capital necessary to build a working model of his invention for a share in the proceeds that will result from the disposition or exploitation of his patent right. But unless the inventor is able to prove his claims, his closest friend will turn a deaf ear to his request for financial assistance.

"If you have a promising invention and no money to build a working model with, instruct your patent attorney to send you a copy of the specifications and claims and a set of blue prints [preferably photo-prints] of the drawings in your case so soon as the principal claims have been allowed, and not to let the application go to allowance until notified by you. Study the copy of the specification thoughtfully and commit to memory the objects of the invention, which, if the application is prepared by a clever attorney, you will find are quite different from those given by you in the letter you sent with the sketch.

"The objects of the invention in a well made patent define clearly, but generically, the principal new features in your machine, and these are the salient points to dwell upon on presenting your proposition to the prospective investor. Show him the references submitted by your attorney after the preliminary examination and point out the features of superiority in your machine in respect of those shown in the references. If there is appreciable merit in your invention you will have no trouble to procure financial assistance.

"It is rarely the case that a miniature model is sufficient to satisfy large investors where the model is needed to demonstrate the efficiency of the machine. In most cases a miniature model would be perfectly useless. The drawing of the log-sawing machine of our example, for instance, shows the operativeness of the machine as clearly and unmistakably as the most perfect miniature working model would, but it does not show that with this machine one man could cut a knotty log in two in one-half of the time it would take two men to do it with an ordinary cross-cut saw. Neither would a miniature model demonstrate this or the efficiency of any machine. It is obvious that where demonstration is needed a miniature model will not take the place of a full size working machine. Many inventors waste enormous sums of money and much valuable time on miniature models which when completed have to be consigned to the junk pile, as they fail to show what the investor wants to see."

"How does the inventor know that his machine will work satisfactorily without a practical demonstration?" inquired Joseph Sharp.

"The inventor works by analogy. For instance, we know that the log-sawing machine will do just what we claim for it, because, as your sister told us, without a fly wheel it is impossible to cut hay with a rotary feed cutter. From this we know that a heavy fly wheel will supply the necessary power to cut the log with ease and rapidity. The investor may see this just as clearly as we do, but an over-cautious man would demand a demonstration.

"Many highly promising inventions that were perfectly operative and commercially practicable were lost to their inventors just because they were not worked out mechanically and the inventors and their backers exhausted their financial resources before the machines were completed. Remember therefore that if you are ever tempted to start

building a working model without having your invention first reduced to a working drawing, you will exhaust your monetary resources and have nothing but a pile of junk for your money.

“Work your invention out yourself as much as possible then place your sketches in the hands of a skillful machine designer for him to elaborate it and to reduce your machine to detailed working drawings. A set of detailed working drawings of a machine may cost one or two hundred dollars, but a set of drawings made by a practical factory draftsman will save you several times their cost in money and time.

“If you will ask a machinist to build your machine on a contract, that is, for a predetermined sum, if he will consider it at all, he will figure out as nearly as he can the time it would take him to build the machine and the cost of the materials and then multiply the grand total by two, and the result will be the figure he will ask for the machine. It will therefore be cheaper for you to pay for his work on your machine by the hour.

“But before you place your working drawings in the hands of any machinist, examine carefully his shop equipment. If your machine requires fine lathe work see that he has a lathe fine enough to do it. If he will have to do it on a large, rickety lathe, it may take him twice as long to do the job and you will have to pay for that extra time. If your machine requires accurate milling, see whether his milling machine is in good order; if not, have him adjust his machine before he starts on your job, else the time he will spend in adjusting his machine or controlling the back lash while he is doing your work will be charged up to you. See whether he has the right kinds and sizes of cutters. If not, let him get them or make them before he starts on your job. See whether he has the right sizes of materials on hand. Cold-rolled machine

✓ steel can now be had in all sizes imaginable and straight and true to the one-thousandth part of an inch. But machinists cannot carry all the sizes in stock. If your machine needs a piece of steel, say 2 inches by one-quarter inch and the machinists has 2 1-2 inches by one-half inch size, he will tell you: 'Oh, that's nothing. I can easily mill it or shape it down to size.' So he can. But it will take him about two hours to do it and you will have to pay \$1.50 for that time. So see that he gets all the sizes of material your machine will need before he starts on the job.

"These little things are always neglected by young and inexperienced inventors. But on a long job these avoidable charges may amount to nearly half of the bill.

"If your machine is composed of several similar sections it is well to make only one section and test it thoroughly before you make the others. It is true that the machine tools will have to be reset for every part in that one section and this will entail some useless expense. But upon testing the first section some changes may become desirable, and if all the sections are finished they will all have to be thrown away and others made in accordance with the new idea.

✓ "Instruct your machinist not to spend any time on polishing and finishing the parts of the machine until the machine is assembled and tested, as some of the parts may have to be refitted or done over."

As the tyros rose and the young lady began to dress, the expressman brought in a small box. I opened it and found it contained a miniature model of a force pump and a letter with a money order. After reading the letter I handed it to my nephew, and he read:

“‘deer Ser, me send yu mit dis a moddell from me fus pomp und a monee order to 30 Dollars for to mak me a pattentt from dis envenshun. me cood no mak a draftin so me had to Git a moddell mad, plees tak gut cair from dis moddell as it cost me 75 dollas. plees Dont let noboddi sie dis moddell und steel my envenshun. send me de papiers from me pattentt to sine as Soon as possible.’”

My nephew was very much amused by the orthography and phraseology of the letter and handed it over to his sweetheart to read for her amusement. I looked at him sharply. He understood that I did not give him the letter to read for his amusement and looked at me inquiringly.

“Do you understand this letter,” I asked him. “It contains a lesson of more or less importance to a young inventor.”

“Why, yes. I understand every word of it. But I would like to see the model. The letter itself seems to contain nothing of importance,” he answered, somewhat abashed by my accusing him of levity.

“That’s just where the lesson comes in. The letter contains nothing of importance, except the fact that the poor fellow spent \$75 to show me something that does not show at all. I cannot show you the model. As a matter of policy I never disclose a client’s invention or communication. I have taken the liberty of showing you this letter in order to point out certain costly mistakes the uninformed inventor often makes. The model is not a working model. It is a solid chunk of iron shaped so as look like a force pump. The invention obviously resides in two pieces of capped and valved pipes which extend laterally from the air chamber of the pump. But what the pipes are for, the inventor does not say. I do have some vague idea of what he wants to accomplish by means of these two additional air chambers. But I could not proceed with the preparation of the specification and

claims without knowing definitely the principal object of his invention and whether it is absolutely necessary that the valves in the two pieces of pipes shall be ball valves, as they are in the model, or that any well known form of valve would do. I will have to write to him and get him to give me some detail description of the thing.

"The inventor says he could not make a drawing of the pump so he spent \$75 to show me a chunk of iron with two pieces of pipe. When one invents something he has a very clear picture of the thing in his mind. With the picture of the thing before his mind's eye, is there any reason why any inventor, whatever his education, should not be able to reproduce that picture on paper? The fact is that the uninformed inventor thinks that in order to convey his ideas to the patent attorney the drawing must be made artistically and finished like the official drawings in a patent application. Why, a free-hand pencil sketch showing the thing he invented exactly as he sees it with his mind's eye, however crooked the lines may be, and however dilapidated the view may be, would convey his ideas just as clearly as if the drawings had been made by an artist.

"The force pump inventor could have easily cut out an illustration of a force pump from a catalogue and sketched in the two pieces of pipe with the valves, and if he had only stated in his letter, in his own way, what he means to accomplish by means of these two pipes, he would have saved himself the cost of the model. A pencil sketch and a detailed description of what the inventor wants to accomplish is all a patent attorney needs to a clear comprehension of the invention submitted.

"Now, my dear children, I can think of nothing to add to what I have already told you, except that after you have elaborated the mechanisms of the invention to the highest degree possible, finish your sketches, put them

away, and throw that particular construction of the mechanisms off your mind entirely. The next day start in anew to invent mechanism of different construction for accomplishing the same object of invention on an entirely different principle, if possible, as in the case of the cooking utensil support.

"If after working at it earnestly for several hours in succession you are unable to conceive a new principle for accomplishing the same object of your invention, then your invention is as good as it can be made. More often, however, you will by this means discover that one or two of the sub-functions in your machine can be accomplished by different means. Make a new sketch of the machine with the sub-functions accomplished by the new means and submit both sketches—with only one fee—to your patent attorney for preliminary examination. If at the examination neither of the two ways is found to be seriously anticipated, decide which is the better of the two ways of accomplishing the same object and tell it to your attorney. The latter will describe the machine with the better means as the preferred form of embodiment of the invention and the other as a modification, and cover both forms under generic claims."

"As the ancients say wisely,
Have a care o' th' main chance,
And look before you ere you leap,
For as you sow y' are like to reap."

—Butler.

LESSON XXII.

The Fourth Essential of a Commercially Valuable Invention.

At the conclusion of the last lesson I gave the tyros to understand that that was all I had to tell them about the business of inventing, and that my self-imposed duty was finished. I ordered Miss Sharp to transcribe the stenographic notes she had taken of the lessons and to give a copy to each of the young men. I had defined only three of the four essentials of a commercially valuable invention, but have taken ample pains to inculcate the importance of employing a skillful patent attorney to make their patents. And as the making of the patent must be left to the skill and integrity of the patent attorney, an exposition on the constituency of a commercially-acceptable patent seemed superfluous. But the tyros had learned enough of the importance of the commercially-acceptable patent to hanker after more.

Joseph, as usual, called every evening, and my nephew every other evening. Several days had elapsed and then the tyros, as if determined to make a formal demand upon me, came over to my desk and took seats without ado.

"You forgot to tell us about the fourth leg of a commercially valuable invention—the commercially-accepta-

ble patent," broached my nephew. "We have discussed every important subject of the lessons and find that we know nothing of the fourth leg of a commercially valuable invention. Lillian [Miss Sharp] says that the legally-valid patent is the commercially-acceptable patent. For what more could the purchaser of, or investor in, a patent right ask than a legally-valid patent. But while her argument sounds logical enough, I cannot persuade myself to believe that if the legally-valid and the commercially-acceptable patent were one and the same thing you would have given the different designations. Please, uncle, dear, tell us the difference, if there is any, between a legally-valid and a commercially-acceptable patent, that we may have a clear understanding of the requirement of a commercially-acceptable patent. For unless our patents will be acceptable to prospective purchasers or investors, they will be utterly useless to us. We are determined to make every possible effort in our power to win fortune by inventing. But if by reason of lack of knowing what to demand we should fall into the hands of incompetent attorneys and become owners of commercially-unacceptable patents, our most constrained efforts to produce commercially valuable inventions would result in harrowing tantalization and a useless waste of time and money."

The last sentence is something I have never heard before from the lips of a young inventor. The young inventor, and many a veteran, too, fails to appreciate the fact that unless his patent is commercially-acceptable it is of no earthly use whatever—and many are the inventors who assassinate their most promising inventions with their own hands. They procure the Rule of Practice and botch up their own patents. Any intelligent person can read up on the rules and follow the forms and make a patent—a fool patent—or there would not be so many

thousands of bogus experts and specialists in the patent soliciting business.

The paramount function of the Patent Office examiners is to safeguard the interest of the public, by seeing to it that the inventor does not get more of a monopoly than he is legally entitled to. However reserved and reluctant a patent examiner may be, he must allow the broadest claims the inventor or his attorney is capable of drawing in view of the state of the art. But the law accords the inventor the privilege to draw his claims as narrow as he wants to, and most of the inventors who make their own patents unwittingly avail themselves freely of this privilege.

It takes considerable experience and a fair grasp of the spirit of both the patent laws and the judicial decisions interpreting the laws to be able to tell a commercially-unacceptable patent from a commercially-acceptable patent, let alone the making of a commercially-acceptable patent. Hence, to the inventor and to the short-sighted attorney all patents are "patents that protect."

Patents are serious matters. But it is extremely difficult to make the young inventor take the patent seriously. Inventing is indeed the only available means by which an ambitious wage earner may raise himself above his class and attain not only financial independence, but even fame and fortune. But without a commercially-acceptable patent the most promising invention is valueless. The determination of the tyros to make every possible effort to produce none but commercially valuable inventions, which of course includes commercially-acceptable patents, pleased me immensely. But I know the fickleness of young inventors, and Joseph Sharp in particular, claimed my attention. I knew he will sooner or later relax in his vigilance, be attracted by some specious advertisement or sophistical Inventor's Guide, and fall into one of the

countless snares the road to financial success by inventing is strewn with. With these thoughts in my mind, I concluded to expound the difference between a legally-valid and a commercially-acceptable patent, and began:

"The difference between a legally-valid and a commercially-acceptable patent is a difference in quantity. The patent to be acceptable must of course first of all be legally valid. But patents that are merely legally valid very often have no commercial value whatever. The law is easily satisfied, the improvident inventor still easier, but the man who is asked to part with his cash not so easy. He has a rigid law of his own.

"In the exposition on the third essential of a commercially valuable invention I have told you of the requirements of a legally-valid patent in the precise language of the law on patents. But laws are one thing and judicial decisions, which interpret the laws, quite another. Our country is governed by laws not as made by the legislative bodies, but as interpreted by the judicial tribunals. The judicial tribunals have interpreted the law I quoted you to mean that a patent to be valid does *not* have to claim every part, improvement, and combination of the invention described in the specification, but that any part, improvement, or combination of the invention described in the specification that is claimed must be described in the specification with perfect perspicuity and claimed specifically and distinctly. Any and all the parts, improvements, or combinations that are not so described and claimed are presumed to have been wilfully abandoned by the inventor and become public property.

"This means that if your invention enunciates ten new principles and only one of them is claimed specifically and distinctly [as in the case of so many of the slip-shod patents so much in evidence], the patent will be valid and secure to you the exclusive right to make, use, and

✓ sell machines embodying that one particular new principle. All the other nine principles become public property, and anybody and everybody that wants to build machines embodying some or all of the abandoned nine principles of your invention may do so without your consent.

“Now suppose you had rendered the Government some valuable services and in recognition thereof you were told to have a deed to a certain ten-room house and lot prepared and presented to a certain authorized government official which he will duly execute, and thus in due form convey to you the property described in the deed. And suppose again that you, to save a few dollars, had employed some shyster lawyer or yourself drew up the deed, and that through lack of your lawyer’s or your own skill that deed by its terms secured to you the exclusive right to occupy only one of the ten rooms instead of all the ten rooms. The remaining nine rooms would by the terms of the gift become public property. Then, so soon as the public found out that the remaining nine rooms are public property, nine of the most disagreeable foreign or colored families crowded themselves into the nine rooms and a little later, in view of your insignificant holding that would never pay you to enforce your deed, took possession of even that one room to which you hold exclusive right. How much would that deed be worth? Nothing, of course. No sane person would buy it for any price, notwithstanding the fact that the deed is signed and sealed by the Government and conveys an exclusive right.

“The prospective purchaser of a ten-room house would not buy the property unless the deed secured to him the absolute possession of not only all the ten rooms in the house, but every inch of the ground of the lot on which the ten-room house stands. Similarly, no capitalist would invest money in an invention unless the patent covers

every phase of the invention and all its future possibilities. The difference between a legally-valid patent and a commercially-acceptable patent is thus, metaphorically speaking, the difference between a deed to one of the rooms in a ten-room house and a deed to all the ten rooms in the house.

“Always bear in mind your objective point—financial success—and never be tempted to save a few dollars on the cost of the patent. If your invention is a public need, its financial success depends entirely on the comprehensiveness of the patent. After the patent is issued you will either have a property right of intrinsic commercial value or just a few sheets of parchment paper, worth as much as a few sheets of newspapers. If you are too poor to afford a studiously made patent—which may or may not cost a few dollars more—you are too poor to waste your hard earned money on a good-for-nothing patent.”

The tyros were thoughtful. After several moments meditation my nephew said contemplatively: “Naturally enough every patent attorney claims to make the best patents. All advertise *patents that protect*. But from what you have told us the phrase means nothing. The patent protects, but it does not protect enough. Now, since the making of the patent is beyond our control, what measures could we take in the future to insure that our patents will cover every phase of our inventions and all their future possibilities. Can you furnish us some kind of a chart or specimen of claims by which we might be able to judge the sufficiency of our patents?”

“Much as I would like to, I find myself utterly incapable of devising any kind of a chart or specimen of claims which might serve as a criterion by which you could judge the sufficiency of your patents. Every invention is a law to itself. The tenor of a set of claims in one case will

not suit in another case. I can only repeat with a little more detail that in a commercially-acceptable patent the specification must describe the invention not only with perfect perspecuity but in comprehensive generic terms, and the claims must claim the invention not only specifically and distinctly, but also generically and specifically. In other words, the specification and claims must be so drawn as to cover not only the machine of your invention, but also every conceivable modification, simplification, reorganization, and adaptation to such other uses as the principles enunciated in the specification may be capable of. In a commercially-unacceptable patent on the log sawing machine of our example, for instance, the broadest claim would probably be worded something like this:

“‘In a log-sawing machine, a pair of rigidly connected frames suitably held a predetermined distance apart, a single frame held movable in the space between the said two frames, a ratchet-toothed rack held rigidly to one end of the said single frame, an arm carrying a saw held adjustably on the said rack, and manually operatable mechanism for moving the single frame reciprocally.’

“This is a legally-valid claim, and perhaps a much broader principal claim than can be found in thousands of patents issued annually. But the patent on the log-sawing machine with such a principal claim would not be commercially acceptable. The claim is too narrow to preclude others from building the same machine only a little different, and a patent that does not exclude competition does not confer a monopoly on its holder and therefore the patent would not be salable.

“Suppose, for example, you were the inventor of the log-sawing machine, and being hard up you employed a cheap patent attorney who furnished you a patent with such a principal claim. You would call on the president

of the Blank Manufacturing Co. and show him that this invention is capable of yielding a minimum revenue of about \$1,000,000 during the life of the patent [see page 71] out of which you expect to make only about \$250,000 and his company could make \$750,000. Mr. Blank, seeing that there was a chance for his company to earn over \$40,000 a year for seventeen years long on a small investment, would proceed to investigate your proposition.

"The first thing Mr. Blank would do would be to place the drawings of the log-sawing machine in the hands of a practical mechanic and order him to devise as many modifications or reorganizations of this machine as he can. With hardly any exception, every mechanical organization is capable of modification, reorganization, and adaptation to certain other uses. So far as I can see at the present it is possible to make three different machines to operate on the same principle without infringing upon this claim. The mechanic would make the three different modifications and submit them to Mr. Blank. Next, Mr. Blank would submit the drawings of the three modifications and a copy of your patent to an able patent attorney and order him to analyze the claims in your patent and ascertain whether any of these modifications infringe upon the claims in your patent. The attorney would report that none of the three modifications infringes upon your patent. Mr. Blank would then promptly return your papers and state in his letter that he is not at the present in a position to interest himself in your proposition. No sane manufacturer would consider a patent proposition that does not confer an absolute monopoly in the machine as a whole, and your prospects to make \$250,000 out of your invention would be lost to you because of the savings of a few dollars in the cost of making the patent."

N. B.—The author has devised the log-sawing machine shown on page 81, as well as all the other illustrations in this book, except three, for the purpose of illustrating the lessons. He has also devised several modifications, or different constructions, of the log-sawing machine, none of which would infringe a patent with such a claim. The modifications are withheld from publication in this edition in order to afford those of the readers of this book who may wish to do so an opportunity to amuse themselves at their leisure by inventing one or more modifications themselves. Every young inventor who has yet to get his experience in machine designing is advised to try his skill and devise one or more of the modifications of the log-sawing machine out of curiosity, and incidentally be benefited by the exercise it will afford him. It is good practice and worth while. The author would greatly appreciate the privilege to inspect the modifications made by the reader purely for his own edification. The sketches will be promptly returned if requested. Address all communications

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Washington, D. C.

The several modifications on the log-sawing machine devised by the author will appear in one of the subsequent editions of this book.

The object of the modifications being to show the readers the importance of covering a case generically; that is to say, to claim the invention in a manner as to cover every possible modification or reorganization and thus keep out all possible competition. In submitting an invention to a patent attorney it is well to show one modification. But whether the inventor shows a modification or not the good attorney will cover every modification possible by means of generic claims.

A modification or a reorganization of a given machine, device or apparatus means an embodiment of the principles involved in that machine, device or apparatus in a different way. As an example, one of the modifications possible on the log-sawing machine is to make the single frame stationary and the double frame to ride upon the upper edge of the single frame. Any broad departure from the principles of the log-sawing machine would not be a modification, but an invention patentable over the best patent that can be made on the log-sawing machine. And this is true of every invention. Every invention, however original or broadly new it may be, is limited to the particular principles of construction and operation enunciated in the specification, and if properly claimed the patent covers all kinds of modifications and reorganizations and substitution of equivalent elements.

"In a well made patent the principal claim on the log-sawing machine would read something like this:

"In a log-sawing machine, a member held movable reciprocally, mechanism for moving the said member reciprocally, an operating tool carried by the said member, and means for effecting progressive movements of the said tool in alternate succession with the reciprocal movements of the said member.'

"This is what is technically termed a "generic" claim. A claim thus formulated secures to the inventor the exclusive right to every possible modification, reorganization, simplification, and adaptation of the principles defined in the specification to to other uses. The patent on the log-sawing machine with such a claim would in consequence be a commercially acceptable patent.

"The ultimate fate of the inventor is largely dependent upon the skill and sagacity of his patent attorney. Genera exists not only in broadly new mechanical organizations, but even in limited improvements on machines or things already embodied in various forms. It requires considerable skill and power of penetration to discern the germs of inherent genera in a mere improvement on a machine of which there are several modifications in use or on record. But if the patent is to be commercially acceptable it must be done, and the only person to do it is a really skillful and thoroughly competent patent attorney. Besides describing the genera and formulating the principal claim, it requires considerable skill to carry out the entire case so as to insure the tenability of the patent.

"In a commercially-acceptable patent the principal, or the broadest, claim is followed by a number of sentences, comprehensive generic and specific claims gradually diminishing in scope and breadth until the exclusive rights

to every new principle, part, and combination is properly secured to the inventor. The specific claims alone are of no great commercial value, unless the machine is of such a nature that every one of its component parts and the manner in which they are arranged and actuated are absolutely essential to the working of the machine. This, however, is very seldom, if ever, the case. Every machine which at the time of its invention seems positively unchangeable will sooner or later be changed by the inventor himself or others. And quite frequently machines are changed beyond recognition by their originators. By means of comprehensive generic claims, and a generically detailed specification, a practical patent attorney endowed with large powers of conception and an analytical mind can secure to the inventor the exclusive right to every conceivable reorganization, simplification, modification, and adaptation of the principles of construction and operation of the machine, as well as to the essential elements thereof.

“The commercially-acceptable patent must have both generic and specific claims, as the generic claims are subject to attack, and no one can be assured that if attacked some of them would not succumb to the attack. It is therefore imperatively essential that the patent shall contain a graded series of both generic and specific claims so that should some of the generic claims fall, what is left of them will be supported by the specific claims.”

My nephew, his bride and her brother, boundlessly enraptured with expectation to win fortune by inventing, shook my hand warmly and thanked me heartily. “Well, uncle, dear,” William exclaimed gleefully, “we are now thoroughly convinced that an invention, however simple it might be, if it comprehends all the four essentials you have elucidated, must, in the nature of events, yield fortune. And now that we have learned how to invent elaborately and methodically, we will make a dash for fortune.”

INDEX

	Page.
Adaptation, the law on.....	126
Advertise, how to.....	185
Advertisements, specious.....	148
Aggregation, not patentable.....	103, 123
Analysis of projected invention.....	71
A patent worse than useless.....	77
Apparatus, principle of, not patentable.....	37
Appearance, elegance of, important.....	175
Application for patent.....	145
Article of commerce.....	34
Article of manufacture.....	39, 127
Arts, how advanced.....	38
Attorney, inventor must depend on.....	36, 200, 210
Attorneys, hasty.....	97, 158
Assignment deprives of control.....	188
Blunders, many being made by inventors..	36, 97, 148, 151, 159, 169, 189
Business policies of patent attorneys.....	148, 150
Carelessness, effects of.....	159
Change in dimensions not patentable.....	39
“ structure patentable.....	39
Chemical composition.....	40, 127
Claims, skill in preparation of.....	77
“ specimen of.....	206, 209
Combinations, patentable and unpatentable.....	103, 123
Compound lever.....	56
Configurations	40, 127
Confused distribution of elements.....	66
Copies of prior patents.....	152, 153, 155, 157
Cost of manufacture.....	82
Criterion of limit of invention.....	39
Criticising elements.....	72, 82
Criticism to be sought after.....	100
Crude model desirable.....	64
Crudities may be eliminated after patent.....	77
Deed and patent, analogy of.....	144, 158
Demonstration of observation.....	43, 117
Description of invention.....	145
Designing no part of inventing.....	65, 75
Design patents.....	103, 128

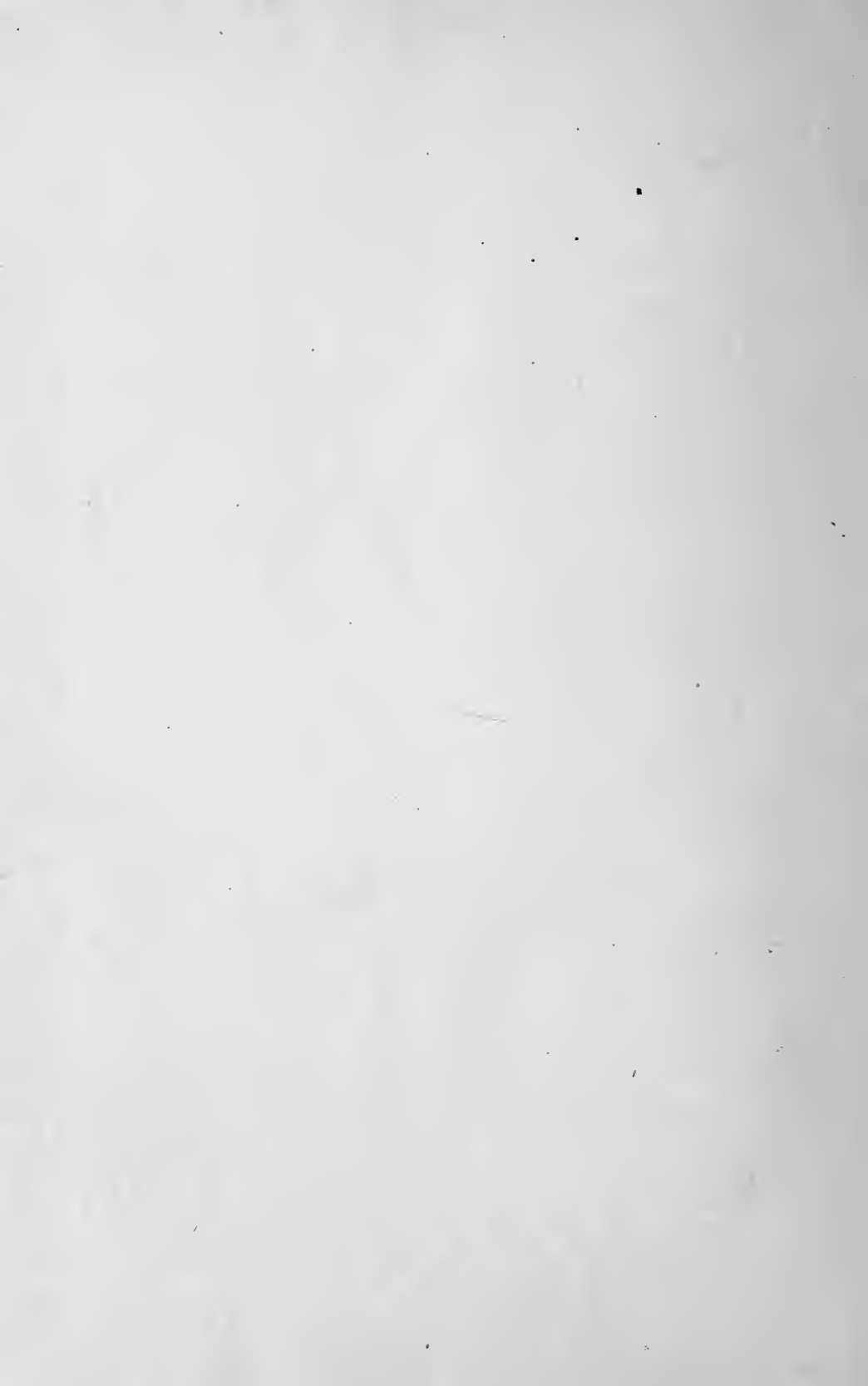
	Page.
Determination	67, 202
Difference between mental faculties.....	38
“ “ patents	204
Diligence, importance of.....	76
Disappointments, causes of.....	34, 142, 207
Discovery of gas or mineral not patentable.....	37
Eccentric, action of.....	72
Elaboration not invention.....	94
Electricity, cardinal principles of.....	131
Electro mechanical devices.....	134
Elements, criticising the.....	72, 82
Errors in construction ruinous.....	79
Essentials of successful invention.....	35
Exclusive use of invention.....	206, 210
Exercise of inventive faculty.....	39
Fate of inventor depends upon skill of attorney.....	210
Faulty performer of function.....	46, 59
Financial assistance, how to obtain.....	193
“ brokers to be shunned.....	182
Fly wheel, function of.....	74
Foolish inventions.....	42, 97, 111, 166
Fool patents.....	77, 97, 202
Forfeiture of application.....	79
Freak, every invention a.....	140
Free search.....	148, 150, 156, 167
Full disclosure of invention.....	145
Gears, names and uses of.....	107
Generic claim.....	209
“ invention	159
Gist of patent law on invention.....	39
“ patent law on patent.....	203
Good-for-nothing patents.....	77, 159, 206
Grant of patent conditional.....	144
Haste, results of.....	158
How breadth of patent is tested.....	207
“ many legs has a horse?.....	34
“ much to ask for an invention.....	177
“ to advertise for investors.....	185
“ to interest a manufacturer.....	172
“ to trace effects to causes.....	46
Improvements advance the arts.....	38
Inoperativeness invalidates patent.....	79
Inventing, what is.....	37
“ a freak of the human mind.....	140
“ by reconstruction.....	40
“ intangible product.....	144
“ legality of.....	40

	Page.
Invention, not dependent on mechanical skill.....	49
" not tenable without patent.....	100, 144
" the commercially valuable.....	35, 210
Inventions, kind of, to make.....	120 to 127
Inventor may avail himself of suggestions.....	75
" must be alert.....	68
" " find need or want.....	42
" " gather knowledge.....	50
" " observe things.....	105
Joint inventors.....	99
Judicious management.....	83
Judgement, errors of.....	139
Judgment, mechanical.....	39
Kinds of levers.....	54
" " products.....	143
Knack of practical inventing.....	67
Law on adaption.....	126
" assistance and priority.....	75
Lever, principles of.....	52
Lever, compound.....	56
Levers, rotary.....	60
Leverage of oars.....	162
Lines of inventions.....	120-127
Machine, principle of, not patentable.....	37
Mode of operation lends patentability.....	40
Monopoly, patent.....	144, 209
Mechanical movements.....	50, 71, 74
Model not required by law.....	76
" crude, desirable.....	64, 76
Meaning of the term "combination".....	103
Modification, meaning of.....	208
Modifications patentable.....	97, 98
Mortgage on patent.....	144, 191
New machine created by improvement.....	38
New mode of operation lends patentability.....	40
Non-invention.....	34
Objective point of inventor.....	42, 205
Observation.....	44, 67, 116, 118
Patented inventions, small and simple.....	40
Patent, what is a.....	143
" like deed.....	144, 158, 204
" making easy job for fools.....	202
" the hastily make kind.....	158, 206
Patents for designs.....	103, 128
Problematical inventions.....	111
Priority.....	76
Practical inventing a knack.....	59

	Page.
Professional skill.....	77, 209, 210
Processes, different kinds of.....	37
Prospectus essential	183
Quantity in patents.....	203
Range of royalties paid.....	178
Reducing inventions to practice.....	75
Reduction to practice, constructive.....	78
Renewal of application.....	79
References on record.....	152, 153, 155, 157
Rights acquired by assignee.....	188
Rule for inventors' guidance.....	44
" of law.....	75, 126
Sketches, free hand, sufficient.....	198
Shop license plan.....	180
Specification, skill in the preparation of.....	77
Specimen of generic claim.....	209
" " specific claim.....	206
Suggestions to be invited.....	100
Tenability of patent how insured.....	210
Test of consummation of invention.....	199
" monopoly conferred by patent.....	207
Title of patent, what affects.....	190
Tracing effects to causes.....	58, 59, 67
Tricks not patentable.....	37
Time to sell a patent right.....	170
Two important provisions in license.....	180
Useful arts how advanced.....	37
Useless expenditures.....	197, 202
Volunteering suggestions not proper.....	89
When a working model is needed.....	194
Why simple invention is patentable.....	39
Where to look for prospective investors.....	184







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